DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

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31 January 2018

EXPIRES 31 JANUARY 2020

Engineering and Design
GUIDANCE FOR EMERGENCY ACTION PLANS, INCIDENT MANAGEMENT AND REPORTING, AND INUNDATION MAPS FOR DAMS AND LEVEE SYSTEMS

TABLE OF CONTENTS

Paragraph

APPENDIXES

LIST OF TABLES

LIST OF FIGURES

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1. Purpose The purpose of this document is to expand and tailor current federal guidelines for dam emergency action planning and other available resources for implementation within the U.S. Army Corps of Engineers (USACE) Dam and Levee Safety Programs. Because there are no federal guidelines for emergency action planning for levee systems, USACE has chosen to apply the same approaches for dam emergency action planning to levee systems, including the Hazard Classification System (reference A-6). This document establishes the requirements for consistent application of certain key Emergency Action Plan (EAP) features for USACE operated/maintained dams or levee systems (referred to as levees in this document). This document also serves as an advisory document for use by other project owners/operators. This document also provides policy for the use and dissemination of inundation map data. The key features requiring particular attention to agency-wide consistency include EAP organization, communications, inundation maps, exercises, incident management authorities and responsibilities, security provisions, and review and approval requirements.

2. Applicability This guidance applies to all USACE operated/maintained dam or levee systems within the U.S. Army Corps of Engineers Dam Safety Program and Levee Safety Program, and are subject to compliance with Engineer Regulation (ER) 1110-2-1156, Safety of Dams - Policy and Procedures, 31 March 2014, or applicable Levee Safety Program policies.

3. Distribution Statement This document is approved for public release. Distribution is unlimited.

4. References All references in this document are listed in Appendix A.

5. Authorities The authority to perform dam and levee safety activities, including during incidents, is provided by Congressional project authorizations. The authority to perform emergency operations is provided by Public Law (PL) 84-99 and implemented by ER 500-1-1 and Engineer Pamphlet (EP) 500-1-1.

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*This circular supersedes Chapters 13 and 16 of ER 1110-2-1156 dated 31 March 2014.

6. General During an emergency the primary objective is to prevent catastrophic uncontrolled releases that could cause life loss and economic or environmental damages and to expedite actions to get people out of harm's way if uncontrolled releases are unavoidable. An EAP is a formal document that identifies potential emergency conditions at a project and specifies pre-planned actions to be followed to reduce consequences of the emergency. An EAP is prepared by the owner/operator of a dam or levee project stressing the actions to take to moderate or alleviate the emergency. The EAP contains procedures and information to assist the project owner/operator in issuing early warning and notification messages. For significant hazard potential projects or high hazard potential projects, where the probability of life loss is high, it also contains inundation maps intended to highlight the downstream critical areas for action. Special attention is given to required coordination between the owner/operator and other stakeholders emphasizing responsibilities during an emergency. These stakeholders include the Federal Emergency Management Agency (FEMA), other federal agencies, state and local emergency management authorities, agencies with flood warning responsibilities, and the public in the potentially affected consequence area. At a minimum, an EAP for a dam or levee must be closely coordinated with state and local emergency management authorities, who then incorporate elements of the EAP into their emergency preparedness and response plans. Project owners/operators are encouraged to co-develop plans with local emergency management authorities whenever possible or to otherwise coordinate to ensure that evacuation plans address EAP scenarios.

a. Plan Name. Multiple naming conventions are used for emergency plans developed by the project owners/operators, emergency management authorities, and local communities. To minimize confusion, USACE policy is to use the '[Project Name] Emergency Action Plan (EAP)' for plans required by this guidance to be prepared and implemented by dam and levee project owners/operators. The more critical issue is ensuring that a joint emergency planning process is taking place that includes the owner/operator of a dam or levee and state and local emergency management authorities.

b. Content and Coordination. The effectiveness of an EAP is greatly enhanced by utilizing a consistent format which ensures critical aspects of emergency planning are covered. Both a comprehensive plan and advance coordination with local and state emergency management officials are critical in facilitating a timely response to an emergency. Appendix B, Model Checklist for Emergency Action Plans, provides a checklist to assist with the development, update, and review of EAPs. The checklist provides questions testing adherence to federal guidelines and certain EAP objectives within the USACE dam safety program and levee safety program. Although the checklist is a useful starting point, potential consequences within leveed areas and floodplains vary as a result of breach, overtopping, or operation of a project. For this reason, every EAP must be tailored to site-specific conditions and should remain simple

enough to encourage use. The EAP should consider the full range of inundation scenarios as well as different detection times for a range of incidents.

c. Guidelines for Emergency Action Planning. The following documents serve as the principal guidance which governs the content, structure, and implementation of EAPs and related inundation maps for the purposes of this Engineer Circular (EC): Federal Guidelines for Dam Safety, Emergency Action Planning for Dams (reference A-20); Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures (reference A-21); and Emergency Preparedness Guidelines for Levees - A Guide for Owners and Operators (reference A-19).

7. Emergency Action Plan Requirements Emergency action plans are required for all USACE operated/maintained dams and levees, including appurtenant structures that would impact different consequence areas than the main dam or levee. EAPs are strongly recommended for all other dam and levee systems within the USACE Dam Safety and Levee Safety Programs. This requirement is more expansive than the federal guidelines, which only require EAPs for high and significant hazard potential projects. EAP format and content should follow the specifics outlined in this document, including the model checklist in Appendix B, but should be scaled appropriately based on consequences. At a minimum, the EAP should include information on notification, emergency detection, response, incident management, and preparedness. For projects that are similar and on the same waterway or in the same basin, one EAP may be developed for the system with a different notification flow chart for each project. An example of implementation of a system EAP would be for navigation projects on the same waterway.

a. Organization. A consistent organization promotes readability of the EAP and enhances effectiveness during exercises and incidents. The goal is a concise document providing easily accessible information that guides emergency actions of all EAP participants. The following topic organization is recommended: I) Summary of EAP Responsibilities; (II) Notification Flowcharts; (III) Statement of Purpose; (IV) Project Description; (V) Incident Response Process; (VI) Roles and Responsibilities; (VII) Preparedness; and (VIII) Inundation Maps. Other EAP sections and appendices should be incorporated as necessary based on type of project. For example, levee EAPs, EAP appendices, or related documents referenced in the EAP should include a section that discusses flood fighting techniques tailored specifically as standard operating procedures for the system. Other typical content or references include a glossary of terms, sample checklists for emergency response and flood response activities, a sample emergency responsibility assignment matrix, surveillance plan, and the project operation and maintenance manual.

b. Communications. Good communication is a key element for successful execution of any EAP. This includes not only internal communications between USACE team members, but also between others who have a role in an emergency event. The project owner/operator should always strive to raise the level of public awareness (e.g., utilization of the media and internet) as it relates to project operations and emergency response procedures. Communications tools and technologies to be used, as well as back-ups, should be considered. A detailed communications plan is recommended to be included as part of the official notification section or as a stand-alone appendix to the EAP in order to reinforce its importance. Items recommended for inclusion are discussed below.

(1) Notification Flow Charts. Flow charts of persons to be notified for each emergency condition and procedures for notification should be included in the EAP. Flow charts effectively depict the order of notification and notification responsibilities. The flow charts should include a description of the primary and secondary means of communication to be used, a listing of telephone numbers and addresses, and other information needed for reliable and prompt contact. Common notification recipients for USACE operated/maintained projects are listed in Table 1. Table 2 lists notification recipients for sponsor-owned projects. Additional guidance for internal reporting is provided in Paragraph 13. Flow charts should be modified as necessary for the particular project. It may be appropriate to define separate flow charts for each emergency level if the primary goal for emergency response varies by emergency level.

Table 1 - Common Notification Recipients (USACE Operated/Maintained)

Component	Dam Safety Element	Levee Safety Element
USACE Internal—District Command Chains	Chief of Operations	Chief of Operations
	Operations Project Manager (OPM) Dam Safety Program Manager (DSPM) Dam Safety Officer (DSO)	Levee Safety Program Manager (LSPM) Levee Safety Officer(LSO)
	Water Management/Regulator	Water Management/Regulator
	District Emergency Manager	District Emergency Manager
	District Commander	District Commander
USACE Internal—Higher Command Chains	Chief of Operations	Chief of Operations
	Major Subordinate Command (MSC) Headquarters (HQ)	MSC HQ
External—Principal Local Officials	Local and State Emergency Management Authorities	Levee Owner/Sponsor Local and State Emergency Management Authorities
External—Other Federal Officials	National Weather Service	National Weather Service
External—Public	Downstream population affected	Individuals and communities in leveed areas

Table 2 - Common Notification Recipients (Sponsor-owned)

Component	Dam Safety Element	Levee Safety Element
USACE District	District Emergency Manager	District Emergency Manager
Local Officials	Local/State Emergency Manager	Local/State Emergency Manager
Other Federal Officials	National Weather Service	National Weather Service
Public	Downstream Population Affected	Individuals and Communities in Leveed Areas

(2) Emergency Levels. The primary purpose of pre-defined emergency levels is to provide clear external communications of project condition and project owner/operator incident management activities. The emergency level helps to define the primary goal of emergency response, such as to intervene to prevent breach or to communicate that breach is occurring to expedite evacuation by emergency management agencies. Existing dam or levee risk assessments may be useful to inform and identify potential failure modes. Districts must develop local internal procedures that will vary based on unique district organization and project characteristics. To ensure consistent external communications, the following emergency levels will be used in all USACE project EAPs. Reference A-20 defines the emergency levels and the following is additional guidance to be followed. Note that for levee projects and dam projects with the possibility of overtopping, the terms “breach,” “overtopping,” or “overtopping/breach” may be used specific to the unique situation.

(a) High flow emergency - The high flow emergency level indicates that flooding is occurring on the river system, but there is no apparent threat to the integrity of the dam/levee system. The high flow emergency level is used by the dam/levee system owner to convey to outside agencies that downstream areas may be affected by the project’s release. USACE water management policies and procedures are to be used for external communications of flood conditions resulting from a high flow operational release. Dam/Levee safety and water management communications must be closely coordinated in situations where high flow operational releases are either warranted in response to a dam/levee safety emergency or coincide with a dam/levee safety emergency.

(b) Non-breach emergency - The non-breach emergency level is appropriate for an event at a dam/levee that will not, by itself, lead to a breach, but requires investigation, increased monitoring/mitigation, and notification of internal and/or external personnel. The project owner/operator’s primary goal is to communicate risk and response activities within the USACE chain of command. The need to perform external communication is situational, based on level of awareness through unofficial channels. Internal dam/levee safety, and possibly emergency management status, is elevated. Upward internal reporting is required.

(c) Potential breach emergency - The potential breach emergency level indicates that conditions are developing at the dam/levee that could lead to breach. Potential breach should convey that time is available for analyses, decisions, and actions before the dam/levee could fail. The project owner’s/operator’s primary goals are to intervene to attempt to prevent breach and to communicate risk to downstream or leveed area stakeholders. Upward internal reporting and external communication are required.

(d) Imminent breach emergency - The imminent breach emergency level indicates time has run out and the dam/levee has breached, is breaching, or is about to breach. Imminent breach typically involves a continuing and progressive loss of material from

the dam/levee. It is not usually possible to determine what a complete breach will take to develop. Therefore, once a decision is made there is no time to prevent a breach, the imminent breach emergency warning must be issued. The primary goal is to communicate risk to downstream or leveed area stakeholders. Upward internal reporting and external communication are required.

(3) Emergency Announcements and Communications. External emergency level communications provide situational awareness and trigger implementation of stakeholder action plans. Externally-communicated emergency levels and internal dam/levee safety and emergency management procedures should be aligned. However, this emergency level guidance does not address internal detection and response levels or processes. Example external emergency announcements and communications for each emergency level should be included in an EAP, with instructions for adaptation based on specifics of an emergency situation. General consistency of emergency announcements throughout USACE is necessary for common understanding throughout the emergency management community and general public. The primary responsibility of USACE is to provide these communications to emergency management officials and to the National Weather Service. Close coordination with these organizations is necessary in rare instances where USACE deems it is necessary to make announcements directly to the public to avoid an imminent threat to life or property. At a minimum, the long form emergency announcement should include and describe the message components in Table 3. Further discussion and example notification scripts are provided in Appendix F, Emergency Notifications.

Table 3 - Emergency Announcement Message Components

Announcement	Message Component
Emergency Signal	Level—alert, watch, or warning
Source	District
Threat	Project condition: non-breach, potential breach, or imminent breach Flow condition: high flow or normal flow
Location	Project name and location Rivers/stream(s) affected Impact area boundaries (easily understood)
Guidance	Nature of emergency/condition Source(s) of additional information Action for public to take
Time	Expected course of events

(4) Dissemination to General Public in Immediate Vicinity of the Project. A description of the procedure and means for dissemination of warnings directly to the general public in the immediate vicinity of the project is required in all EAPs. The procedure should consider estimates of the detection, notification and warning times for these locations and specifically state the organization with primary responsibility for issuing initial warnings (e.g., local law enforcement, National Weather Service). Pre-coordinating these actions with official warning and evacuation authorities is essential to ensure effectiveness. In rare instances where threat to life or property is imminent, USACE may need to temporarily take the lead in issuing public warnings and undertake evacuation actions in advance of local authorities. In such instances, USACE should only undertake such activities until such time as local authorities are notified and able to effectively assume those responsibilities. The EAP must clearly identify where (specific locations) and under what circumstances USACE will undertake public warning and evacuation actions. Example situations include campgrounds, individual structures and small communities in the immediate consequence zone. For larger communities, even if standard warning and evacuation processes are determined to not be timely, USACE may not have the resources in place to temporarily lead warnings or evacuations. In these instances, dedicated emergency warning systems may need to be put in place to reduce warning times.

c. Project Owner/Operator Responsibilities. Each EAP must include information to help guide the project owner/operator in making immediate operational decisions for a range of emergencies relevant to the project. Information must be included to identify the need for and sources of equipment, material, labor, and other necessities for carrying out emergency repairs. Items to be considered for inclusion as appendices or referenced from other documents include: a problem assessment chart (See Appendix G); a schedule of operations; an emergency gate operation plan; a reservoir dewatering plan (dams only); a description of equipment and materials to be stockpiled for use in carrying out emergency operations and repairs; assignments of responsibilities for carrying out emergency operations and repairs; description of needs for equipment, material, and labor not available at the site which are needed to carry out each type of emergency operation or repair; and a listing of nearby contractors and other sources of needed equipment, material, and labor including a description of procedures for securing their assistance on an emergency basis.

d. Documentation Control and Protection of Sensitive Information. The project owner/operator should develop a distribution list for those involved in implementing the EAP. The list must be reviewed and updated regularly. Each copy of the EAP that is distributed should be controlled by copy number and a notice requesting that additional copies of the EAP not be made. Outdated copies should be returned to the owner/operator or destroyed to prevent misuse. Information deemed For Official Use Only (FOUO) must be marked and disseminated according to Army Regulation (AR) 380-5 and Department of Defense Manual (DoDM) 5200.01.

e. Sensitive information includes information that could pose a security risk or aid those intending to do harm to a USACE project. FOUO information is not publicly releasable, but may be shared on a need to know basis. When sharing sensitive information with the project owner/operator or emergency management authorities, the districts must inform them which information is sensitive and that the sensitive information should not be publicly released. Technical data and personal contact information should not be provided to the public. Detailed technical information is typically not required by emergency management authorities, although the project owner/operator must provide enough information for them to perform their duties. Technical information includes, for example, engineering details (text and drawings) specific to the project, location of deficiencies, inspection reports, potential modes of failure, and facility details. Technical information can be shared by keeping specific engineering details in controlled EAP copies, while removing such details from copies distributed to outside agencies that have no specific need for the information. Districts should coordinate with the District Operational Security Officer and District Office of Counsel, who will assist in determining the sensitivity of information and ensuring that sensitive information is appropriately labeled as FOUO and redacted as appropriate.

f. It is acceptable to disseminate EAPs electronically for rapid dissemination and usability. EAP authors are encouraged to establish document organization schemes that allow for efficient production of EAP versions both with and without sensitive information content.

g. The EAP may reference other response and contingency plans that exist for the project, such as for fires, loss of power, oil leaks or chemical spills, bridge collapses, and active shooter incidents that are traditionally not addressed in an EAP. This will help to convey the comprehensiveness of planning that has been conducted for a broad range of incidents.

8. Emergency Action Plan Map Requirements Project owner/operators are responsible for incorporating inundation maps into EAPs, disseminating EAPs, and augmenting EAP maps beyond the established standard when warranted. Maps are a necessary component of an EAP and are used to facilitate timely notification by the project owner/operator and evacuation of potentially affected areas by emergency management agencies. They delineate the areas that would be flooded due to a project breach, overtopping, or operational release. An inundation map shows either the actual or predicted extent of flood water within an area for future pre-determined flood events, ongoing flood events, or past flood events. For dams, including dam appurtenant features, and levees, an inundation map can show the predicted extent of inundation from breach or non-breach flooding combined with antecedent flow assumptions, if applicable. Inundation may be a result of normal reservoir operation, emergency operation, structural failure, or other operational events. An example of a non-breach inundation are discharges through a dam spillway or levee overtopping without breach. An example of a breach inundation is breach of a dam or levee embankment. EAP

maps are generally not required when the project breach or overtopping does not cause any incremental flooding, when project breach or overtopping would not exceed downstream channel capacities or flood stages, or when consequences are limited to loss of service (e.g., navigation or hydropower disruption due to loss of pool).

a. EAP maps are required for any high- or significant-hazard potential project.

b. When required, EAP maps must be prepared for the inundation scenarios described in Table 4.

Table 4 – Inundation Scenarios Required for EAP Mapping

USACE	Equivalent Designation in Federal Guidelines [Reference A-21]
Dams	
Normal high failure	Sunny day with project failure
Maximum high failure	Flood with project failure
Maximum high non-failure	Flood without project failure
Levees	
Breach prior to overtopping	No existing federal guidance
Overtopping with breach	
Overtopping without breach	

c. The term “failure” is used within inundation scenario names on many USACE EAP maps. For the purpose of this EC, “failure” and “breach” are equivalent terms for map scenarios. Over time, the Dam Safety and Levee Safety Programs will continue to work toward consistent use of the term “breach”.

d. The maximum high failure pool is commonly the maximum inflow design flood (IDF) elevation. It includes full utilization of available surcharge, flood, conservation, and inactive and dead storage. The maximum high failure pool scenario typically results in the greatest areal extent, depth of downstream inundation, and life safety and economic consequences. The normal high failure pool corresponds to the ten percent exceedance duration pool elevation (exceeded about ten percent of the time or 36 to 37 days per year on average) which can be obtained under normal regulated operating conditions. This scenario represents a relatively high, but normal, pool condition which can be expected to occur every year.

e. The top of levee breach scenario represents the worst case in terms of flooding of the leveed area that can be attributed to the performance of the levee infrastructure. The levee overtopping scenarios demonstrate the impact of a large flood that exceeds the capacity of the levee. The relative frequency of the loading conditions for the top of levee and overtopping scenarios varies based on the height of the particular levee system. A critical breach location, which can affect the areal extent of flooding behind levees, is typically assumed.

9. Emergency Action Plan Map Standard The USACE EAP map standard will be followed for inundation maps published with EAPs for USACE operated/maintained projects. Coordination with the Modeling, Mapping and Consequences (MMC) Production Center, Mandatory Center for Expertise (MCX) is required to obtain the most current and appropriate map templates for dams and levees. The MMC MCX maintains the USACE EAP map standard, as well as map templates and production tools to support efficient map preparation. An example of the map standard index, map sheet, and profile sheet is included in Appendix H. While the actual production work may be completed locally, coordination with the MMC MCX is mandatory prior to work on mapping beginning so the most current and appropriate guidance can be provided for a specific project. The USACE EAP map standard is intended to provide a consistent, user-friendly (i.e., easier to read/interpret), and accurate product for USACE dam safety, USACE levee safety, USACE emergency management, and state/local emergency management. The USACE EAP map standard provides information about inundation areas, failure/flood wave arrival time, and flood maximum elevation information which informs management authorities of evacuation planning responsibilities. The standard places emphasis on quality and presentation of these map features which are derived from hydrologic and hydraulic model outputs. Other map data and features, such as base map layers and critical infrastructure locations, achieve compliance with federal guidelines through use of national databases and map services.

a. Protective Markings. EAP maps are considered sensitive data and must be marked For Official Use Only according to AR 380-5 and DoDM 5200.01.

b. Additions to EAP Map Standards. The USACE EAP map standard defines the minimum acceptable map format. Additions, enhancements, or improvements exceeding the standard are allowable when warranted by project-specific requirements. The MMC MCX maintains a knowledge base that includes examples of EAP map enhancements that have been made for specific projects. Districts are encouraged to review the knowledge base when planning local EAP mapping projects, and to submit examples of enhancements for incorporation in the knowledge base.

c. Dissemination. EAP maps are to be disseminated with EAPs, following policy discussed in Appendix D. The dissemination of EAP maps to emergency management authorities facilitates their ability to prepare for an emergency by enabling them to develop emergency response plans and evacuation plans.

10. U.S. Army Corps of Engineers Emergency Action Plan Map Repository When EAP maps are produced locally, districts must provide a copy of source geographic information system (GIS) layers and publication-formatted electronic maps to the MMC MCX which is responsible for consolidating the information into national databases.

11. Emergency Exercise Requirements

a. Purpose of Exercises. Training and regular exercises are necessary to maintain proper operational readiness. In addition, annual meetings between project owners/operators and emergency responders can facilitate a better understanding of roles and responsibilities and will enhance emergency readiness. The state of readiness should also be determined through periodic and regular simulations of emergency events. These emergency exercises should be initiated by the project owner/operator and should involve all of the key players who would normally be involved in an actual event. Consideration should be given to combining exercises for projects in the same watershed or multiple projects in the same geographical area. Periodic exercises will result in an improved EAP as lessons learned during the exercise can be incorporated into the updated document.

b. Participants in Exercises. Nearly any dam or levee safety incident has detection and reaction components. Joint district participation in exercises should, therefore, include dam/levee safety and related technical elements such as the dam/levee safety officer, the dam/levee safety program manager, the emergency management office, project operations staff, district water management office, and technical support elements. Local downstream emergency management authorities should participate and state emergency management authorities may participate. The exercise program should ensure both the technical aspects (i.e., internal district performance relating to detection and decision-making) as well as emergency management aspects of dealing with appropriate state/local officials are fully covered and evaluated. Periodic exercises that address both technical and emergency management aspects are necessary as part of the comprehensive exercise program. Focusing on only one aspect at the expense of the other can be dangerous as it could lead to a false sense of security regarding readiness.

c. Exercise Frequency. The frequency and complexity of emergency exercises should correspond directly to the Dam Safety Action Classification (DSAC) or Levee Safety Action Classification (LSAC) and the hazard potential classification of the project. The definitions of the various hazard potential classifications are in ER 1110-2-1156, Appendix J. The Dam Safety Officer (DSO)/Levee Safety Officer (LSO) is responsible for management oversight and implementation of exercises at USACE operated/maintained projects. At a minimum, the EAP exercise schedule listed in Table 5 for dams and levees must be followed for all projects having life loss or significant property loss implications. Emergency events can be credited as an exercise provided that EAP notification processes are followed, conduct of the incident is properly documented, and the lessons learned from the incident are incorporated into the updated EAP. Credit for lower-order exercises can be claimed provided that a higher-order exercise is conducted and has a sufficiently broad scope to meet the goals of the lower-order exercise or exercises.

Table 5 - Dam and Levee Emergency Exercise Frequency

Exercises / Classifications	Seminar	Drill	Tabletop	Functional	Full Scale
DSAC/LSAC 1 and High Hazard Potential	Annual	Annual	Biennial, recom-mended for odd years	Biennial, recom-mended for even years	At DSO/LSO discretion
DSAC/LSAC 2 and High Hazard Potential			Biennial	At DSO/LSO discretion	
DSAC/LSAC 3, 4 or 5 and High Hazard Potential and All Significant Hazard Potential			Year 5, 10, etc.		
All Low Hazard Potential	Initial orientation seminar or drill. Subsequent exercises at the DSO/LSO discretion.				

d. Exercise Levels. The definitions of the exercise levels are included in Appendix C. It is recommended that all exercises be based on a potential failure mode of concern for the particular project. If an exercise has not been conducted in the last five fiscal years, it is recommended to start with a seminar or drill, followed by a tabletop exercise, and work up to the exercise level appropriate for the DSAC/LSAC. Districts are also encouraged to conduct systems exercises for neighboring projects and projects with overlapping downstream reaches and projects within the same local emergency management jurisdictions. The exception is the highest risk projects (DSAC/LSAC 1 and DSAC/LSAC 2) where exercises should be specific to each project. Low hazard potential dams and levees, regardless of the assigned DSAC/LSAC, require only an initial orientation seminar or drill and then subsequent exercises at the discretion of the DSO/LSO. At their discretion and judgment, districts may choose to periodically conduct something more elaborate (i.e., tabletop, functional, or full-scale) if they deem the situation warrants. By requiring greater exercise frequency at DSAC/LSAC 1 and DSAC/LSAC 2 dams and levees, the safety programs are balancing adherence to federal guidance exercise frequency recommendations with risk informed decisions to best utilize constrained operations and maintenance (O&M) funding.

e. Homeland Security Exercise and Evaluation Program (HSEEP). The HSEEP is a capabilities- and performance-based exercise program which provides a standardized policy, methodology, and terminology for exercise design, development, conduct, evaluation, and improvement planning (Department of Homeland Security, 2013). HSEEP policy and guidance is presented in detail in HSEEP Chapters I-III. Adherence to the HSEEP policy and guidance ensures exercise programs conform to established best practices and helps provide unity and consistency of effort for exercises at all levels of government. Use of the policy and guidance presented in HSEEP is recommended to ensure that exercise programs conform to established best practices and aids in interaction with emergency service partners. Additional information about HSEEP is available from the Department of Homeland Security (DHS) at https://www.fema.gov/media-library/assets/documents/32326.

12. Incident Management Incident management authorities and responsibilities for USACE operated/maintained projects are shared among command, dam/levee safety, emergency management, and operations functions. The incident management approach for events at USACE projects, as summarized below, follows the policies and procedures of the USACE Civil Emergency Management Program (references A-5 and A-8).

a. Dam or Levee Emergency Level. USACE emergency levels for dams and levees are listed in Paragraph 7b(2). District commanders will establish the dam or levee emergency level for a dam or levee incident, which establishes district posture and facilitates execution of EAP response and notification actions. Authority to establish the project emergency level for an incident is delegated to deputy district commanders, and all supervisors in the dam or levee safety program chain from the district commander through the dam or levee safety program officer to the operations project manager as needed to ensure rapid response and notification.

b. Declaration of Emergency - Civil Emergency Management Program. In conjunction with determining the emergency level, it may be necessary for district commanders to issue a formal declaration of emergency. A declaration of emergency is necessary to implement Civil Emergency Management Program authority as further explained in ER 500-1-1 and EP 500-1-1. Authority to issue a declaration of emergency is delegated to deputy district commanders and all supervisors in the chain from the district commander to the chief of emergency management. District Commanders may withhold authority to issue a Declaration of Emergency, either by written correspondence, or via a published operation plan (OPLAN).

c. Roles and Responsibilities. To ensure appropriate coordination and communication of dam and/or levee incidents it is important that command, safety program, and emergency management and operations project manager points of contact are included in EAP notification flow charts.

(1) District Commander. The district commander declares and manages project incidents and emergencies, with delegations noted above. The district commander is responsible to decide courses of action to assure life safety and reduce risk of project failure. The district commander is responsible for coordinating decisions with higher command when regional or national impacts may occur.

(2) Dam Safety Officer and Levee Safety Officer. The DSO and LSO serve as principal technical advisors to the district commander for dam and levee safety incidents. Upon issuing a declaration of emergency, these officers serve on the Crisis Management Team (CMT). They are responsible for upward reporting as specified in Paragraph 13. Upon issuing a declaration of emergency, district dam and/or levee safety program managers serve on the Crisis Action Team (CAT).

(3) District Emergency Manager. The district emergency manager serves as principal advisor to the district commander for disasters and emergencies. Upon issuing a declaration of emergency, the district emergency manager serves on the CMT and provides overall management of USACE emergency/disaster operations. Within the National Incident Management System (NIMS) framework, the district emergency manager serves as the primary point of contact with state and local incident manager(s). Further responsibilities of the district emergency manager are provided in EP 500-1-1, including responsibility for upward reporting in the emergency management chain.

(4) Operations Project Manager. The operations project manager is responsible for monitoring activities, notifications of distress to the district office, and other functions as defined in the project operations and maintenance manual, the EAP, and/or the water control manual. During declared emergencies the operations project manager is the manager on site and involvement with the CMT and CAT is crucial.

d. Coordinating Project Emergency Level and Emergency Operation Center (EOC) Activation Level. As stated in Paragraph 7b(2), USACE uses standard emergency levels for all external coordination and communication. Table 6 provides recommended alignment of USACE project emergency levels with appropriate USACE EOC activation levels as defined in EP 500-1-1.

Table 6 - Recommended Alignment of Dam and Levee Emergency Levels and Emergency Operation Center Activation Levels

Project Emergency Level / EOC Activation Level	I Normal Operations	II Emergency Watch	III Partial Activation	IV Full Activation
High Flow Emergency	--	Based on severity, hours of field operations and required EOC posture		
Non-Breach Emergency				
Potential Breach Emergency	--	--	Based on severity, hours of field operations and required EOC posture	
Imminent Breach Emergency	--	--	--	X

e. Project-Specific Authorities and Responsibilities. Specific authorities and responsibilities for incident management should be documented in district all hazards plans, project surveillance plans, and EAPs.

f. Exercises and Training. Dam and levee safety exercises and training materials for incident management should be designed to test awareness of incident management processes and responsibilities. Project-specific dam and levee safety training materials for project personnel should address the USACE incident management approach to ensure understanding and responsibilities at all organizational levels.

13. Incident Reporting – Internal When evidence of distress is reported to the district DSO/LSO, the DSO/LSO must confirm the situation and determine if an engineering evaluation of the condition is needed or remedial measures are required. If additional action is warranted, the district DSO/LSO will coordinate with the district emergency manager (EM) to initiate MSC coordination, develop the commander nominated Serious Incident Report (SIR), and draft follow up Situational Reports (SITREP). SIRs are defined in Chapter 8-2 and 8-3 of AR 190-45. SITREPs are defined in ER 500-1-1 and EP 500-1-1. Districts develop and release SIRs via ENGLINK and draft SITREPs. MSCs review and release SITREPs via ENGLINK

a. The district DSO/LSO is responsible to notify the MSC dam/levee safety officer and MSC dam/levee safety program manager by telephone, with follow-up documentation and digital photos via email. The MSC DSO/LSO will coordinate with the MSC EM to support SIRs, SITREPs, and other products as required, and will forward the SIR or SITREP and all subsequent reports to the dam and levee safety incident email (DLL-HQ-Dam Levee_ Incident). The HQDSPM will coordinate with the MSC for any follow up information and will inform the HQ DSO/LSO.

b. For evidence of distress on dams, the district DSO is also responsible to submit an MSC DSO endorsed narrative summary of the incident including an assessment of risks and appropriate photographs within the incident manager of the Dam Safety Program Management Tool (DSPMT). Since all USACE projects are different, engineering judgment must always be exercised in determining whether or not an item warrants upward reporting. Generally, anything which has the potential for life loss or significant negative economic implications, or anything which could garner political or media attention should be reported. Example problem assessment charts for example incidents for dams are in Appendix G. Figure 1 shows upward reporting of distress.

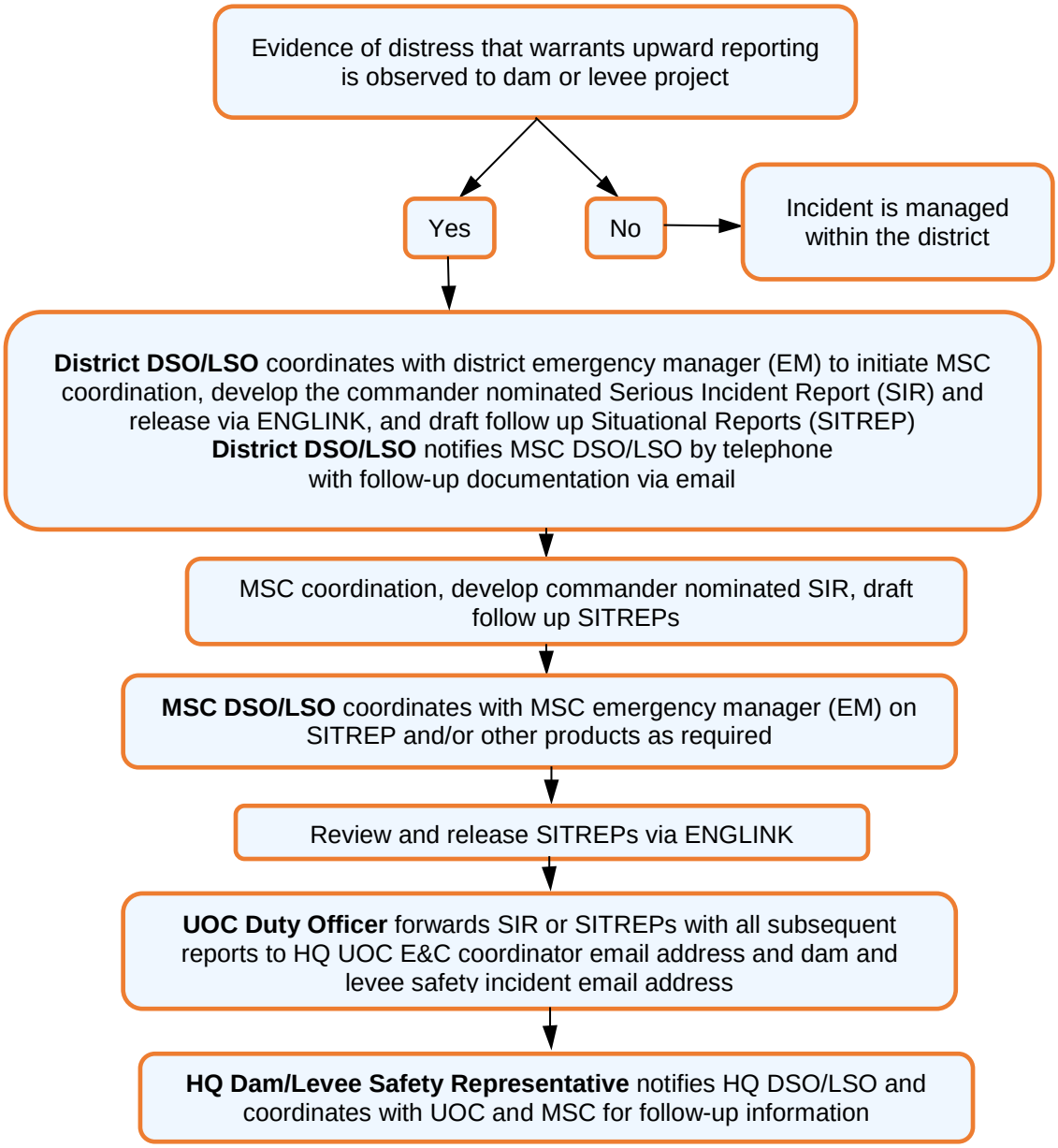

Figure 1 - Reporting Evidence of Distress to Dam and Levee Projects to USACE Operations Center and Headquarters Dam Safety Officer/Levee Safety Officer

14. Security Provisions A comprehensive EAP should consider security provisions, including those needed for the potential of man-made disasters (e.g., acts of terrorism)

surrounding a project during an emergency event. Potential man-made disasters are particularly critical as they can potentially occur with no warning thereby resulting in very little response time.

15. Review and Approval of Emergency Action Plans The organizations responsible for review and approval of EAPs and EAP updates are as shown in Table 7.

Table 7 - Emergency Action Plan Review and Approval for U.S. Army Corps of Engineers Operated and Maintained Projects

Status	District	MSC
Projects with new EAP or significant update	Formulate, recommend, and implement. Reviewed by district DSO/LSO	Reviewed and approved by MSC DSO/LSO
All projects	Annual review required; update when needed. Update notification list annually.	Review during periodic inspection/assessment

16. Emergency Action Plan Funding Development and approval of EAPs and maps will be funded with project-specific O&M funds, with the exception that the MMC MCX is centrally funded to support development of inundation scenarios and EAP maps as part of periodic assessments and risk assessments. MMC MCX priorities are established by the assessment schedules and any direct requests for support to the MMC MCX Director outside the assessment cycle.

a. Exercise Funding. Exercise planning and participation will be funded with project-specific (O&M) funds. Emergency management participation in exercises will be funded through Class 110 Flood Control and Coastal Emergencies (FCCE) funds. It is appropriate for emergency management to use project-specific O&M funds in the event that emergency management is asked to lead development and execution of dam or levee safety exercises.

b. Incident Management Funding. Funding guidance for responding to incidents at USACE projects is provided in ER 500-1-1. In summary, response to incidents for USACE operated/maintained dams and levees is funded through project-specific O&M. This includes any technical or direct work associated with the incident. EOC operations, including any flood fighting downstream of the incident, are funded through FCCE.

EC 1110-2-6074
31 Jan 18

FOR THE COMMANDER:

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10 Appendices
(See Table of Contents)

Appendix A

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Appendix B

Model Checklist for Emergency Action Plans

B-1. Purpose The purpose of this checklist is to support the development and review of EAPs for USACE operated/maintained projects to ensure adherence to federal guidelines and meet certain USACE dam safety and levee safety program objectives. The checklist follows the outline recommended by the Federal Guidelines for Emergency Action Planning for Dams (FEMA P-64) for dam emergency action plans (EAPs), and is designed in such a way as to promote collaboration and project-specific customization as EAPs are prepared. The checklist thus poses a set of questions to promote dialogue and ensure the EAP responses are well thought out and inclusive of all necessary stakeholders and parties. The checklist ensures that EAP sections occur in appropriate logical order. The checklist questions encourage an appropriate amount of detail within an EAP and that all relevant information is included.

B-2. Approach The checklist is modeled after a worksheet developed by the National Dam Safety Review Board (NDSRB) EAP Work Group, with modification to emphasize certain USACE dam safety and levee safety program objectives. The NDSRB worksheet was originally developed as input for preparing the EAP module within the DHS/USACE Dams Sector Analysis Toolkit (DSAT).

B-3. Emergency Action Plan Checklist

a. EAP Organization

- Is the EAP logically organized? Is important information readily accessible and easy to understand?
- Document adheres to title guidelines: [Project Name] emergency action plan.
- Emergency action plan adheres to order of information presentation and main section headings recommended in federal guidelines: (I) Summary of EAP Responsibilities, (II) Notification Lists, (III) Statement of Purpose, (IV) Project Description, (V) Incident Response Process, (VI) Roles and Responsibilities, (VII) Preparedness, (VIII) Inundation Maps.

(1) Summary of EAP Responsibilities

- Summarize the critical steps for responding to an incident and implementing the emergency action plan.

(2) Notification Flow Charts

- Identify who is to be notified, by whom, and with what priority (i.e., names, positions, telephones numbers, and radio call numbers). Note: One list, or a set of lists, may

be needed depending on the complexity of the hazards associated and different lists may be required based on the emergency level.

- Identify primary district command, safety program, water management, operations, and emergency management points of contact. Identify responsibilities and points of contact for reporting up these chains, district through MSC to headquarters.
- What is the emergency level of the notification list if more than one list is required?
- Describe the process and the individuals who will notify project owner/operator representative and/or emergency management authorities.
- Describe the process and parties involved in the prioritization of notifications, including specifically who will be notified.

(3) Statement of Purpose

- Include a brief statement describing the purpose and scope of the plan.

(4) Project Description

- Describe the project, including its location, National Inventory of Dams (NID) identification number if a dam or National Levee Database (NLD) system identification number if a levee, and project vicinity map with project features.
- Describe areas with the shortest response time where the project owner/operator has unique and elevated warning and evacuation responsibilities, if any:
  - Roads are adversely affected from a breach or overtopping.
  - Are the affected roads primary, secondary or other [private, fire]?
  - Residential structures are adversely affected from a breach or overtopping.
  - Commercial structures are adversely affected from a breach or overtopping.
  - Critical facilities; schools, hospitals, long term care facilities, etc.
  - Downstream impacts [dams, levees, utilities, water or sewage facilities, public places (parks, campgrounds), etc.].
  - Responsibility for initiating and directing the evacuation process for these locations.
- Describe the maximum affected area. Provide an overview of affected communities and infrastructure. For dams, be certain to note any impacts upstream of the project that could require emergency response.

(5) Incident Response Process

An incident is defined as an event occurring at a dam or levee that could potentially result in a dam or levee safety issue.

<u>Step 1 - Incident Detection, Evaluation, and Emergency Level Determination</u>

- Describe the current measures in place for detecting existing or potential performance issues.

- What operating information, such as normal and abnormal reservoir level data or past performance records, exists for detecting and evaluating breach or overtopping?
- Describe the monitoring equipment, such as water level sensors and early warning systems.
- Describe the monitoring and instrumentation plans that are currently in place.
- Describe the process for analyzing and confirming incoming data to promote performance issue detection and evaluation.
- Describe the inspection procedures and results after an incident has occurred.
- Describe the process for determining which emergency levels apply to an incident.
- Use the emergency levels recommended in this EC (non-emergency, non-breach emergency, potential breach emergency, or imminent breach emergency). Provide rationale for differing emergency levels, if used.

Step 2 - Notification and Communication

- Describe the process for coordinating with emergency management authorities.
- Describe the process for internal coordination among operations, safety program, water management, emergency management, and command functions.
- Establish process for determining district emergency operations center activation level aligned with incident type and severity.
- Describe any checklists or pre-scripted messages that help adequately describe the emergency situation to emergency management authorities.
- Include example pre-scripted messages for each emergency level as attachments.
- Describe the process in place to make periodic status reports to the affected emergency authorities and other stakeholders according to the notification lists and associated procedures.

Step 3 - Emergency Actions

- Describe what actions should be taken to mitigate performance issues in order to prevent breach.
- Describe the process, at the action level, for how the project owner/operator will continually assess the status of the situation and keep other relevant parties informed through established communication channels.
- Describe the process for how emergency levels might be reassessed during Steps 2 and 3 as the situation either improves or deteriorates.
- Describe the security measures required to secure the affected operational areas to protect operations personnel and the public.
- Describe the authorities for taking emergency actions at the project, for the chain of command from the district commander through the dam/levee safety officer to the operations project manager. Include discussion of how authorities vary by incident type, and severity, if appropriate.

Step 4 - Resolution and Follow-Up

- Describe the process and associated tools/mechanisms that currently exist to determine that an incident at the project has been fully resolved.
- Describe the process and the relevant parties involved in conducting an after action review at the resolution of an incident. The description should address the following items:
    - Description of the events leading up to, during, and following the incident.
    - Description of significant actions taken by each participant and improvements for future emergencies.
    - Description of the strengths and deficiencies found in the incident management process, materials, equipment, staffing levels, and leadership.
- Description of any corrective actions identified and a planned course of action to implement recommendations.

(6) Incident Response

Describe the responsibilities of all involved parties to ensure that effective and timely action is taken should an emergency occur at the project. Verify operations staff on site are empowered to immediately react to emergencies and to initiate notifications.

(a) Project Owner/Operator

- Describe the process, at the action level, for the following duties of a project owner/operator:
    - Detecting and evaluating safety incidents
    - Classification of safety incidents
    - Notification of emergency management authorities
- Describe the chain of command within the district and how the chain of command changes upon declaration of an emergency. Note: Responsibilities should be coordinated with appropriate levels of management to ensure full awareness of organizational capabilities.

(b) Notification and Communication

- What is the process for determining which individuals are to notify emergency management authorities? Who is responsible for this process? Is this process clearly documented and made available to all relevant parties? Note: When developing the EAP, the project owner/operator and local authorities should discuss and determine the most efficient protocol to follow.
- Describe the process and relevant parties involved for issuing flood warnings and the process for determining who has primary responsibility for this process.
- Describe the process to determine if/when the district may activate its EOC to serve as a central coordination point of contact (POC).

- Who is the Public Information Officer (PIO) responsible for disseminating information and handling inquiries?

(c) Evacuation

- What are the notification, warning, and evacuation responsibilities of the project owner/operator?
- What are the notification, warning, and evacuation responsibilities of the local emergency management authority?
- How does the project owner/operator coordinate with the appropriate authorities when routine notifications and evacuation does not suffice (i.e., residence located immediately downstream of a dam or a campground that would be inundated within minutes of a dam failure)?
- See examples of threats with associated protective actions in Tables B-1 and B-2.

Table B-1 - Example Protective Actions
Based on Breach Threat Level for Dams and Levees

PHYSICAL OBSERVATIONS*	THREAT LEVEL DESIGNATION	FLOOD THREAT	PROTECTIVE ACTION OPTIONS
Water flowing through breach in embankment	**Imminent Breach Emergency**	Imminent or in progress	• Evacuate—vehicle • Evacuate—pedestrian • Evacuate—vertical • Evacuate—safer structure • Expedient protection of people • Avoid area
Rapidly enlarging sinkhole	**Potential Breach Emergency**	Very likely	• Evacuate—vehicle • Expedient protection of possessions • Avoid area
New seepage areas with cloudy discharge or increasing flow rate	**Non-Breach Emergency**	Possible, but not certain	• Expedient protection of possessions • Seek or monitor information • Prepare to evacuate
*** This column contains examples of physical observations; these observations should be tailored to fit individual projects**			

Table B-2 - Example Protective Actions
Based on Threat Level for High-Flow Emergencies

FLOOD THREAT	PROTECTIVE ACTION OPTIONS
Significant for some occupied structures and evacuation routes	Evacuate—vehicle Evacuate—pedestrian Avoid Area Expedient protection of structures Expedient protection of possessions
Some near river in unoccupied areas	Evacuate—pedestrian Seek or monitor information Avoid area Prepare to evacuate
None outside of channel	Evacuate—pedestrian if in or on water Avoid area (water) Continue normal activities

(d) Monitoring, Security, Resolution and Follow-Up

- Who is responsible for on-site monitoring during an emergency incident?
- How are status updates provided so everyone involved is informed of developing conditions?
- What are the provisions for security measures during an emergency? Note: For additional information on dam security measures, see the DHS Dams Sector Security Awareness Guide, 2007 (reference A-16).
- Who is involved in determining when the incident has been safely resolved?
- What coordination is required when making the decision to terminate response effort?
- What are the project's recovery activities? How do these activities impact a critical public utility such as water supply or electricity?
- How are follow-up evaluations coordinated after an emergency? Who is involved in the evaluation?
- How are the results of the follow-up evaluation documented in a written report?

(e) EAP Coordinator

- Who is the EAP coordinator?
- What is their responsibility regarding EAP-related activities?
- How do they prepare revisions to the EAP?
- How do they establish training seminars?

- When and how do they coordinate EAP exercises?

(7) Preparedness

Describe preparedness actions already completed, as well as established pre-planned actions, that can be taken after the development of emergency conditions for the following categories.

(a) Surveillance and Monitoring

- For an unattended project, what are the remote surveillance systems that include instrumentation for continuous monitoring of headwater levels, tail water levels and project load levels that should be considered?
- For project owners/operators with operations centers that are attended 24 hours a day, what are the systems for monitoring water level rate of change and alarms when prescribed limits or levels are exceeded?
- For automated monitoring systems, what provisions are made for power interruptions and loss of communications with the monitoring instrumentation?
- What are the procedures for providing continuous surveillance for periods of actual or forecasted high flows?

(b) Evaluation of Detection and Response Timing

- What is the total EAP implementation time? Assess by evaluating time required for incident detection, emergency level determination, and notification of appropriate entities involved.

(c) Access to the Site

- What are the primary and secondary routes for reaching the site using various access methods (i.e., foot, boat, helicopter, snowmobile, etc.)? Are the response times for these routes indicated in the EAP?

(d) Response during Periods of Darkness

- What is the response to potential or actual emergency conditions during periods of darkness?
- What are the special instructions for the project operation and/or emergency management authorities?
- How does the response time differ from responses in daylight?

(e) Response during Weekends and Holidays

- What is the response during weekends or holidays?

- Who are the designated response personnel? Is alternate (non-business) contact information needed?
- Are there special instructions for project operation and/or emergency management authorities? If so, what are the instructions?

(f) Response during Periods of Adverse Weather

- What is the response with specific actions during adverse weather conditions when the project is attended?
- What is the response with specific actions during adverse weather conditions when the project is unattended?
- What are the methods of access to the site (i.e., foot, boat, snowmobile, etc.)?

(g) Alternative Sources of Power

- What are the alternative sources for spillway gate operations, pumps, or other emergency needs?
- What is the location of each alternative power source, its mode of operations, and, if portable, a means of transportation with routes to be followed?

(h) Emergency Supplies and Information

- What is the name and contact information (including back-ups) for suppliers, additional personnel, contractors, consultants, and any other entities that may be needed to assist the project owner or emergency management authorities in responding to a project emergency?
- What are the materials needed for emergency repair, including routes?
- What is the equipment needed for emergency response or repair and its location, and who will operate the equipment?
- Who are the local contractors, vendors, and suppliers for project-related equipment and supplies? Provide contact information and maps/directions to their locations.
- If stockpiling materials and equipment is not applicable, what is the justification for this decision?
- Where applicable, describe the following:
    - The need for coordination of information on flows based on weather, runoff forecasts, breach/overtopping, and other emergency conditions
    - If applicable for dams, the actions to be taken to lower the reservoir water surface elevation and when and how this should be taken
    - If applicable for dams, the actions to be taken to reduce the inflow to the reservoir from upstream projects
    - If applicable for dams, the actions to be taken to reduce downstream flows, such as increasing or decreasing outflows from downstream projects on the waterway on which the project is located or its tributaries.

(i) Training and Exercising

- What is the training performed at the project and how often is it performed?
- Describe the process and/or activities for thoroughly testing coordination and communication roles and responsibilities during comprehensive EAP exercises.
- What is the proposed exercise schedule and plan for an EAP exercise program?

(j) Alternative Systems of Communications

- What are the alternative communications (i.e., emergency sirens, cellular phones, text alerts, direct connect, email, intranet, radios, social media, and couriers) and the operating procedures and special instructions for the use of these systems?

(k) Public Awareness

- Describe the public awareness measures that are performed.

(8) Inundation Maps

Ensure coordination with the MMC MCX to obtain current maps or, if district-produced, to obtain current map templates and instructions for implementing the EAP map standard. Document the following:

(a) Overview

- Describe mapping scenarios and assumptions
- Describe purpose and use
- Include disclaimer
- Describe data sources
- Describe model approach, results, and assumptions (pool levels, antecedent flow conditions, breach formation)

(b) Map Sheets

- Publication date
- Arrival and peak times and elevations provided at select locations
- All map sheets clearly labeled For Official Use Only
- Legend
- Index

(c) Dissemination of Maps

- Incorporated into EAP and disseminated with EAP
- If locally produced, GIS layers and map sheets provided to MMC MCX for consolidation in national databases

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Appendix C

Exercise Guidance

C-1. Introduction This appendix provides general guidance for USACE districts to consider as they develop emergency exercises for USACE operated/maintained dams and levees. This appendix is written in the context of all owners/operators of dams or levees as it provides overall best practices for exercises. Owners/operators of dams and levees should test their emergency action plans on a regular basis to identify areas of strength and areas that need improvement. Exercises should be conducted in partnership with entities that have a response role or could be affected by an incident at a dam or levee.

a. Several documents are available online that specifically address how to design an exercise. Through their Homeland Security Exercise and Evaluation Program (HSEEP), the Department of Homeland Security is a primary source of exercise design guidance. Specifically, they state, “The Homeland Security Exercise and Evaluation Program (HSEEP) doctrine consists of fundamental principles that frame a common approach to exercises. Applying these principles to both the management of an exercise program and the execution of individual exercises is critical to the effective examination of capabilities.”

b. The HSEEP guidance document does not address exercise design criteria, but is intended to present relevant information in a manner that will support dam and levee owners/operators in their efforts to develop an exercise scenario. By understanding how a project can be affected by various incidents or events, owners/operators are better prepared to look for areas of improvement and create better relationships and understanding among their partners. Information about HSEEP is available from DHS at https://hseep.dhs.gov/pages/1001 About.aspx.

c. Exercises promote prevention, protection, and responses to incidents and emergencies, and may also be extended to include recovery operations. Exercising demonstrates both the effectiveness of the EAP in an actual situation and the levels of readiness of key personnel. Periodic exercises result in an improved EAP when lessons learned during the exercise are incorporated into an updated EAP document. This also serves the purpose of creating familiarity with the EAP for the entities that have a response role.

d. When conducting an exercise, dam and levee owners/operators should include entities defined in the EAP with a response role. Owners should also consider including other partners without a response role, such as upstream property owners or neighboring downstream jurisdictions that may be affected by an incident. To facilitate the participation of partners, exercises can also be coordinated with, or integrated into, other event exercise scenarios for earthquakes, floods, hurricanes, and other hazards.

C-2. Risk Assessment Risk assessments are performed on dam and levee projects to determine project performance issues. Risk assessments also determine populations and critical infrastructure at risk within flooded areas. Emergency exercises can be tailored to account for risks to project performance and consequences based on results of the risk assessment. Risk assessment guidance for dams can be obtained from ER 1110-2-1156, Appendix L.

C-3. Exercise Types Discussion-based and operations-based exercises defined within the HSEEP framework are discussed below. Although it is not required that every exercise program include all seven exercise types, the program should be built from the ground up, beginning with simple exercises and advancing to more complex exercises. Sufficient time should be provided between each exercise to learn and improve from the experiences of the previous exercise.

a. Discussion-based Exercises. Discussion-based exercises familiarize participants with current plans, policies, agreements, and procedures, or may be used to develop new plans, policies, agreements, and procedures. Discussion-based exercises include:

(1) Seminars and workshops. These types of exercises consist of informal discussion of roles and responsibilities and/or introduction of policies, procedures, plans, and responsibilities.

(2) Tabletop exercises. This type of exercise is an informal discussion of a simulated emergency in a low stress environment. Participation can involve, but is not limited to, project owner/sponsor, state and local EMA, and local officials. This is useful for evaluating plans and procedures, such as an EAP and can resolve questions of coordination and responsibilities.

b. Operations-based Exercises. Operations-based exercises validate plans, policies, agreements, and procedures; clarify roles and responsibilities; and identify resource gaps in an operational environment. Types of operations-based exercises include:

(1) Drill. A drill is a coordinated, supervised activity usually employed to test a single specific operation or function within a single entity, such as testing sirens and warning systems, calling suppliers, checking material on hand, and conducting a call-down drill of those listed on the notification flowchart.

(a) For internal project-specific responsibilities, try running a no notice drill. A no notice drill is conducted when project operators want to test a response activity without notifying staff beforehand. There is always the possibility that real-time response actions will be required without warning of an impending incident. No notice drills are an important tool in identifying areas for improvement.

(2) Functional Exercise. A functional exercise examines and/or validates the coordination, command, and control between various multi-agency coordination centers, such as EOCs and joint field offices. A functional exercise does not involve first responders or emergency officials responding to an incident in real time.

(3) Full-Scale Exercises. The full-scale exercise is a multi-agency, multi-jurisdictional, multi-discipline exercise involving functional joint field offices, emergency operation centers, and first responders' or emergency officials' responses to a simulated event, such as activation of the EOC and role-playing to simulate an actual emergency event. Functional and full-scale exercises are considered comprehensive exercises that provide the necessary verification, training, and practice to improve the EAP and the operational readiness and coordination efforts of all parties responsible for responding to emergencies at a dam or levee. The basic difference between these two exercise types is that a full-scale exercise involves actual field movement and mobilization; in a functional exercise, field activity is simulated. The primary objectives of a comprehensive exercise (functional and full-scale) are to:

(a) Reveal the strengths and weaknesses of the EAP, including specified internal actions, external notification procedures, and adequacy of other information, such as inundation maps.

(b) Reveal deficiencies in resources and information available to the dam or levee owner/operator and partners.

(c) Improve coordination efforts between the dam or levee owner/operator and partners. Close coordination and cooperation among all responsible parties is vital for a successful response to an actual emergency.

(d) Clarify the roles and responsibilities of the dam or levee owner/operator and emergency management authorities.

(e) Improve individual performance of the people who respond to the dam or levee breach or other emergency conditions.

(f) Gain public recognition of the EAP.

C-4. Frequency of Exercises The seminar, drill, tabletop exercise, and functional exercise should receive the most emphasis in an EAP exercise program. The following are recommended frequencies for these exercise types. Dam and levee owners/operators, in consultation with their partners, should determine actual frequencies appropriate for their dam or levee. USACE will apply the exercise frequency shown in Table 5 of the main EC.

a. A full-scale exercise should be considered when there is a specific need to evaluate actual field movement and deployment. When a full-scale exercise is

conducted, safety is a major concern because of the extensive field activity. If a dam or levee owner/operator has the capability to conduct a full-scale exercise, a commitment should be made to schedule and conduct the entire series of exercises listed in C-3b(1)–(3) before conducting the full-scale exercise. At least one functional exercise should be conducted before conducting a full-scale exercise. Functional and full-scale exercises should also be coordinated with other scheduled exercises, whenever possible, to share resources and reduce costs.

C-5. Evaluation of Exercises Emergency exercises and equipment tests should be evaluated. Immediately after an exercise or actual emergency, an after action review (AAR) should be conducted with all involved parties to identify strengths and deficiencies in the EAP. The AAR should focus on procedures and other information in the EAP, such as outdated telephone numbers on the notification flowchart; inundation maps with inaccurate information; and problems with procedures, priorities, assigned responsibilities, materials, equipment, and staff levels. The AAR should also address the procedures that worked well and the procedures that need improvement. Responses from all participants involved in the exercise should be considered. The AAR should discuss and evaluate the events before, during, and after the exercise or actual emergency; actions taken by each participant; the time required to become aware of an emergency and to implement the EAP; and improvements for future emergencies. After the AAR is completed, the EAP should be revised, as appropriate, and the revisions disseminated to all involved parties.

C-6. Exercise Development Typically, developing an exercise consists of a planning and design processes. The level of effort required for planning and design is commensurate with the degree of difficulty of the exercise. A drill will take less effort than a functional exercise. The overall exercise planning process includes:

a. Basis for conducting an exercise

b. Design and development

c. Conduct of the exercise

d. Evaluation of the exercise

e. Improvement planning (i.e., identifying areas of improvement and implement corrective actions).

C-7. Exercise Design The design process is the most extensive part of the exercise planning process and typically includes the following steps:

a. Scope. What capabilities will be tested and who will be involved.

(1) Example Exercise Scope

This tabletop exercise (TTX) will emphasize the roles and responsibilities of Raging River Power Company personnel, and other affected agencies, in response to an incident at Raging River Lake Dam. It will be conducted in a no-fault, low-stress, learning environment as a valuable training tool for those involved.

The TTX will involve reacting to a potential dam safety incident on July 4th. Affected jurisdictions and agencies include [insert list of all affected partners].

b. Purpose. What is the exercise focused on achieving.

(1) Example Exercise Purpose

The purpose of this exercise is to provide participants with an opportunity to evaluate current concepts, plans and capabilities for a response to an incident at Raging River Lake Dam.

This exercise will focus on roles with regard to the dam owner/operator responsibilities for:

- Detecting an emergency situation;
- Evaluation of the severity of the situation and decisions relating to response actions (including actions to preserve the integrity of the dam); and
- Communications of internal and external notifications during an incident at Raging River Lake Dam.

c. Scenario. What is the incident or event to be used for testing and evaluating participant capabilities? This should directly reflect the results of the risk assessment and be a scenario most likely to affect the dam or levee. The EAP should identify many of the potential emergency situations (i.e., initiating condition or triggering events) that may affect the dam or levee. It is recommended that more than one incident be tested and that cascading effects should also be considered.

(1) Example Exercise Scenario

The area has received 3 inches of rain in the past 72 hours from a series of pop-up thunderstorms and the weather service is forecasting unstable weather patterns over the next several days that are likely to result in thunderstorms capable of producing rainfall rates up to 2 inches per hour, hail, and tornados.

(a) Exercise Objectives. The objectives should focus on activities that would or could occur in the context of the exercise scenario. Example exercise objectives:

- Detection and Evaluation. Raging River Power Company personnel recognize an emergency situation using initiating conditions in the EAP, and

classify the severity of the situation using the emergency levels defined in the EAP.

- Notifications. Coordinate and control dissemination of accurate operational information (i.e., discharge from dam, flood stage/elevation, time frames, contact information, emergency duration, termination of incident, pre-scripted message) and resources in a timely manner from Raging River Lake Dam to all participating agencies.
- Operational Coordination. Clarify agency roles and responsibilities in support of an emergency situation at the dam and associated flooding downstream.
- Public Information. Discuss options to provide timely information to the population and assist in minimizing chaos. Review plans to preclude dissemination of conflicting data.
- Warning and Evacuation. Identify specific warning and evacuation response actions, for each emergency level, to include in an EAP.
- Warning and Evacuation. Evaluate the ability of the [insert a responsible entity] and other affected agencies and jurisdictions to implement emergency response actions, including warning and evacuating populations at risk, as outlined in their EAPs and other applicable procedures.

(b) Scenario Events and Timelines. In most instances, an exercise will be conducted in a compressed timeframe. In reality, the example exercise scenario provided in Paragraph C-7c would likely cover several days. However, the actual exercise time may only be a few hours. It is critical during the exercise design process to provide sufficient context for participants; identify and describe the timing of events; develop injects; and provide an appropriate amount of time for discussion of actions taken by exercise participants.

(c) Evaluation Guidelines. Exercise staff must ensure that participants are aware of how the exercise will be evaluated. The evaluation process results in reviewing what worked well and where improvements are needed.

(d) Updating the EAP. Though not part of the exercise process, updates to the EAP are typically derived from the exercise outcomes. After identifying areas of improvement, dam and levee owners/operators and their partners need to determine what corrective actions are necessary to how those actions will be implemented. When these activities are completed, the EAP will be revised.

C-8. List of Categorized Exercise Topics The following is a list of example exercise topics to aid in designing emergency exercises.

a. Communications - Internal (those with a role in the emergency response, onsite and offsite)

(1) Notifications

(a) Is everyone who needs to know the situation included?

(b) How long does it take to complete the call list?

(c) Is National Weather Service (NWS) on the list?

(d) If impacts to neighboring jurisdictions, are they contacted and when?

(e) Are alternate contacts identified?

(2) Notification Methods

(a) Landline/cell phone viability

(b) Radios

(c) Are redundant communications in place?

(3) Media engagement

(a) Who should media requests be directed to?

(4) Are all terms and emergency levels clearly understood?

b. Communications—External/general public (onsite and offsite)

(1) Utility of pre-scripted messages

(2) Notification Methods

(a) Landline/cell phone viability

(b) Media

(c) Radios

(d) Sirens

(e) Social networking sites

(f) Are redundant communications in place?

(3) Tailored language for audience

(4) Notification of neighboring communities

c. Structural Issues/Risk-Driving Potential Failure Modes

(1) Spillway gate failure

(2) Gantry crane failure; bring in a crane to open Tainter gate

(3) Internal Erosion/Seepage/Piping

(4) Structural Movement and Instability

(5) Structural fire

(6) Closure failure

d. Response

(1) Location of Incident Command Post

(2) Who’s needed and when?

(3) Who’s doing what?

(4) Coordination Between Onsite And and Offsite Resources

(5) Evacuations

(a) How long does it take to contact affected parties?

(b) How do you handle people unwilling to evacuate?

(6) Response Scenarios

(a) Mass casualty

(b) Identification and preparation of family assistance centers

(c) Critical facilities in inundation zones

(d) Evacuation of boaters

(e) Missing persons/search and rescue

(f) Loss of power and/or potable water

(g) Blocked evacuation routes

(h) Accessibility and receipt of state support/resources

(i) Suspicious activity [person(s), vehicle(s), etc.]

(j) Ability to mobilize necessary equipment (owned or by contract)

(k) Use of emergency management entity's emergency operations plan and standard operating procedures

(7) If a breach/overtopping occurs, how long does it take to respond and protect assets in the immediate downstream area?

e. Flood Fighting

(1) Types of potential emergencies requiring flood fighting

(2) Equipment and materials to be stockpiled

(3) Assignments of responsibilities for flood fighting and repairs

(4) Access to equipment, material, and labor not available at the site

(5) Access to nearby contractors and other sources of needed equipment, material, and labor

f. Effects/impacts

(1) Industries

(2) Other dams and levees

(3) Marinas

(4) Failed infrastructure such as gas/oil pipelines, cell towers, etc.

(5) Emergency Response facilities (Fire Departments/Emergency Medical Services (EMS)/EOC/Police Departments)

(6) Hospitals/Daycares/Schools/Other Areas of Population Congregation

g. Traffic control

(1) Offsite

(2) Evacuations

(3) Re-entry

h. Power loss

(1) Power Loss Onsite/Back-Up Power

(2) If Facility Is Hydroelectric, Power Loss to Community

i. Technological

(1) Power Grid Failure (Internal or External)

(2) Equipment Failure (Spillway or Outlet Works)

(3) Cyber Attack

j. Recovery

(1) Debris Management

(2) Infrastructure Repair

(3) Shelters

(4) Re-Entry By Evacuees

(5) Economic Impacts

(6) Length of Time to Repair Dam or Levee

k. Inundation Maps

(1) Depth of Water at Cross Sections Provided?

(2) Time to Arrival and Crest

(3) List of Impacted Properties and Uses (Residential Versus Non-Residential)

(4) Identification of Critical Facilities

(5) Can Users Read and Understand the Maps?

(6) Identify Liaison to Aid in Inundation Map Interpretation

l. Security

(1) Terrorist

(2) Active shooter

(3) Explosives

(4) Bomb threat

(5) Sabotage

(6) Vandalism

(7) Other criminal action

m. Environmental

(1) Hazardous Waste Spill/Contamination

(2) Loss of, or Negative Impact to, Fish or Wildlife

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Appendix D

Use and Dissemination of Dam and Levee Inundation Map Data

D-1 Purpose This appendix provides guidance on the use and release of inundation maps and all appurtenant data such as the models and assumptions used to develop inundation maps for dams and levees within the USACE Dam and Levee Safety Programs. It addresses how and under what circumstances inundation maps should be shared with other federal agencies, emergency management authorities, and the public.

D-2. Dissemination Guidance Table D-1 provides a summary of the dissemination guidance. USACE recognizes its responsibility to protect public safety and welfare by effectively communicating information to stakeholders and the public related to risks associated with USACE operated/maintained dams and levees, while also protecting the security of those dams and levees by safeguarding sensitive information. Effective communications will empower stakeholders and the public to make informed decisions about their personal welfare and safety. USACE intent is open data sharing with other federal, state, and local agencies to accomplish their missions, especially with emergency management authorities. USACE intent is a more restrictive policy with the public, as other federal, state, and local agencies and emergency management authorities have primary responsibility for issuing warnings and conducting evacuations.

Table D-1 - Dissemination of Emergency Action Plan Map Data

	Stakeholders		
	Other Federal Agencies	State and Local Emergency Management Authorities	Public
Data sharing	Open		More restrictive
Data sources	HIFLD, District		MSC, District
Protective markings	FOUO		Situational
Data type releasable?			
Non-editable	Yes; recommend non-disclosure agreement		Emergencies: Yes Non-emergencies: provide information in writing for an individual piece of property
Editable	Yes; recommend non-disclosure agreement		No
Supporting	Yes; recommend non-disclosure agreement and close technical coordination		No
Owned by others	No; refer requestor to HIFLD. (It is okay to display location symbols on non-editable products).		No

D-3. Dissemination Provisions For EAP maps and inundation maps which include dams and/or levees within the project area, all inundation mapping will be subject to the provisions in Subparagraphs a–e. An inundation map shows either the actual or predicted extent of flood water within a study area for future pre-determined flood events, ongoing flood events, or past flood events. For dams and levees, an inundation map shows the predicted extent of inundation from breach or non-breach inundation combined with antecedent flow assumptions. Inundation may be a result of normal reservoir operation, emergency operation, structural failure, or other operational events. An example of a non-breach inundation is discharge through a dam spillway or levee overtopping with the levee intact. An example of a breach inundation is breach of a dam or levee embankment.

a. Protective Markings. Inundation maps that show sensitive data must be marked For Official Use Only according to AR 380-5 and DoDM 5200.01.

b. Data Associated with Inundation Maps. There are four categories of data: non-editable (static) data, editable (dynamic) data, supporting (model) data, and data owned by others. Definitions of these data categories are available in the glossary.

c. Dissemination of Inundation Map Data to Other Federal and State Agencies and Local Governments. USACE's intent is to have an open policy with other federal, state, and local agencies in order to aid them in accomplishing their missions, especially with emergency management authorities. Emergency management authorities may need both static and dynamic inundation map data to fulfill their responsibilities, including preparation of evacuation plans. Commands will normally provide information as follows:

(1) Non-editable (static), editable (dynamic), and supporting (model) data may be provided to federal agencies, including, but not limited to, NWS, DHS, and FEMA; adjacent and potentially impacted dam and levee owners and sponsors; and state and local authorities who provide emergency services. Sharing such information with these entities advances federal government interests by assisting local authorities in protecting public health, safety, and welfare, while limiting the extent to which information could be used to threaten the project's security. A non-disclosure agreement, signed by the USACE official releasing the information and an official from the receiving organization, is recommended (see Appendix E for an example). Supporting data will only be provided upon request and should be closely coordinated to assure appropriate use within model constraints. The intent of the agreement is to ensure the receiving organization is aware of any disclaimers and understands information purpose, use, and assumptions. The agreement should authorize use within the receiving organization and limit rights to further dissemination outside the organization.

(2) State information release laws should not be a factor in determining whether information will be shared with others.

(3) The editable (dynamic) data for existing dam and levee breach/overtopping inundation modeling scenarios produced by the MMC MCX are provided to the National Geospatial-Intelligence Agency (NGA) for distribution to federal, state, and local partners through the Homeland Infrastructure Foundation-Level Data (HIFLD) working group data sets. The HIFLD is a GIS data set containing hundreds of data layers assembled from federal, state, local government, and private sector DHS partners, and portions of the data set are FOUO. USACE-provided inundation map data is FOUO HIFLD secure content. The data set is assembled by the NGA in partnership with the DHS to identify sensitive critical infrastructure that is important to homeland security. Requests from other federal and state agencies and local government entities for editable (dynamic) data can be referred to the HIFLD working group. Districts can also provide data directly, and it is recommended the recipient sign a non-disclosure agreement indicating that further distribution, including posting the provided information to a website, requires further approval from the Corps of Engineers. Note, critical infrastructure points and other base map data not created by USACE should be removed prior to releasing dynamic inundation map data.

(4) Districts must provide the MMC MCX with locally-developed or revised breach/overtopping inundation layers for incorporation into the USACE centrally-managed inundation map database. This ensures official inundation boundaries published in emergency action plans are supplied to the HIFLD working group via NGA.

d. Release of Inundation Map Data to the Public. USACE has a restrictive policy with the public, as other federal, state, and local agencies and emergency management authorities have primary responsibility for issuing warnings and conducting evacuations. Commands may release non-editable (static) inundation map data to the public as provided below, for public safety and welfare purposes.

(1) Static maps including HIFLD data must follow HIFLD data release policies. Facility location symbols can be displayed, but no further identifying information can be provided with static products. The inundation map standard maintained by the MMC MCX includes a detailed listing of HIFLD policies for layers used within the map standard.

(2) Upon request, non-editable (static) inundation information may be furnished on an individual piece of property. The request should identify the property location and the current owner. The information provided to the requestor will be based on identified property and include time and depth of inundation. The information should be requested in writing and the reply provided in writing.

(3) During a declared emergency - such as a dam or levee safety incident, a flood, or a potential flood event - dam and levee inundation modeling is prepared by USACE district offices in partnership with NWS or by the MMC MCX through the national flood inundation mapping (FIM) cadre to support real-time flood fighting efforts. USACE MSCs have the authority to release static and dynamic GIS data developed to support real-time flood inundation mapping to the public in support of flood fighting activities as well as making the public aware of potential consequences. However, requests to USACE for HIFLD data not prepared by USACE will be referred to DHS. MSCs may delegate the authority to release inundation maps to their district offices. When the MSC/district releases data during flood events, they must inform the UOC. If the flooding event is of national significance, the UOC may choose to host the flood inundation data as a web service to communicate the situation to the public.

e. Disclaimer for Release. Depending on the quality and accuracy of the source data, inundation model results vary greatly in quality and accuracy. Sharing those results with the state and local emergency response authorities, the community, and the public, even when preliminary, promotes preparedness, emergency response, and recovery efforts. Before sharing, products must have appropriate caveats, such as, “This data/map was created on dd/mm/yyyy by USACE using the best available data at the time. It may or may not accurately reflect existing conditions.”

Appendix E

Example Non-Disclosure Agreement

[Office Letterhead]

CE[XXX-XX] [Date]

MEMORANDUM FOR [Recipient]

SUBJECT: [Project Name] [Emergency Action Plan Name]

Printed Name: _____

Organization: _____

Title: _____

This non-disclosure agreement is presented in response to the request for a copy of the [Project Name] [Emergency Action Plan Name] [or related information]. The information contained in this plan has been classified as For Official Use Only. This places restrictions on the storage, transmission, dissemination, and disposal of the information contained in the plan. Specific handling instructions according to Army Regulation (AR 380-5, Chapter 5) are provided.

The information and maps contained in the [Emergency Action Plan Name] may be exempt from further public release under the Freedom of Information Act (5 U.S.C.552). Any further distribution of this information requires approval from an authorized U.S. Army Corps of Engineers official. Your signature below acknowledges your agreement to adhere to the procedures and policies associated with For Official Use Only documents.

Thank you.

[Signature]

I, _____, acknowledge that I will adhere to the policies, procedures, and conditions associated with the [Project Name] [Emergency Action Plan Name] classified as “FOR OFFICIAL USE ONLY.”

Signed: _____ Date: _____

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Appendix F

Emergency Notifications

F-1. Purpose This appendix provides details on how to structure and when to utilize emergency notifications. Example scripts are provided. The publication, “A Guide for Public Alerts and Warnings for Dam and Levee Emergencies,” was used to develop the following scripts. A copy of the publication can be found using the link in Paragraph F-5.

F-2. Definitions

a. **ALERT** - severity signal used as a descriptor in external communications to indicate a low degree of danger; typically used to signal end of a previously-communicated emergency or to provide information about a non-emergency situation that has obtained awareness through unofficial communications channels.

b. **WATCH** - severity signal used when the risk of breach and/or high flows has increased significantly, but its occurrence and/or timing is uncertain. The purpose of the communication is to ensure broad emergency management and public awareness of the situation in preparation for, and in the advance of, the need to initiate evacuations.

c. **WARNING** - severity signal used when a breach and/or high flow is occurring, is imminent, or has a very high probability of occurring. A warning is used for conditions posing an imminent threat to life and property. The purpose of the communication is to initiate evacuations.

d. High flow - Any controlled operational release, uncontrolled operational release, or breach flow that may result in increased flooding and could require evacuations.

Table F-1 - Notifications Required for Emergency Condition

Emergency Level/Project Condition	**Flows**	**Signal**	**External Notification Required?**	**Internal Notification Required?**
High flow	High	**WATCH** or **WARNING** depending on level of severity	Yes	Yes
Non-breach	Normal	**Alert**	Situational	Yes
	High	**WATCH**	Yes	Yes
	High	**WARNING**	Yes	Yes
Potential breach	Normal	**WATCH**	Yes	Yes
	High	**WARNING**	Yes	Yes
Imminent breach	High	**WARNING**	Yes	Yes

F-3. Long Message Notification Script Long messages, such as press releases, emails, and telephone calls, to emergency management authorities and the National Weather Service should be presented in the order specified in Subparagraphs a(1)–(7).

a. Script order

(1) Heading

(2) Signal

(3) Source

(4) Threat

(5) Location

(6) Guidance

(7) Time

b. Template. Each of these message components are identified in brackets in the provided sample messages to highlight the components and are not to be used in actual communications. *Italicized text* represents information that would be filled in on an emergency specific basis.

(1) The heading serves as a subject line in email communications and a title for press releases. It would not be used within telephone scripts.

(2) Signal: **Warning**, **Watch**, **Alert**

(3) Project Condition: imminent breach, potential breach, non-breach

(4) Flow Condition: imminent high flow, potential high flow, non-high flow.

[HEADING] **[SIGNAL] [project condition] [flow condition] [project name , location]**

This is a [SIGNAL] declaration by the [SOURCE] U.S. Army Corps of Engineers (USACE), [*District Name*] District ([*District Acronym*]). [THREAT] A [*project condition*] due to [*describe cause*] exists at [LOCATION] [*Project Name, (NIDID or NLD System ID), nearest community, state*].

[GUIDANCE] Flooding can be expected [*characterize and indicate if evacuations are warranted*]. Additional information is available in the [*reference emergency action plan*], including appropriate USACE contacts for situational verification. The [*District Name*]

District Emergency Operations Center [*indicate operations level*]. Updates will be provided as available.

[TIME] [If applicable, high flow:]Discharges from [*source, outlets/spillway/combination*] of [*rate in cfs*] will begin at [*time, day, date, year*] down the [water body] and will continue through [date].

[TIME] [If applicable, non-high flow:] Discharges are anticipated to remain at normal operational levels.

F-4. Short Message Notification Script Short messages using media with character limits, such as Wireless Emergency Alert, Short Message Service, Twitter, and text messaging should be presented in the order specified in Subparagraphs a(1)–(5).

a. Script Order

(1) Source

(2) Guidance

(3) Threat

(4) Location

(5) Time

F-5. Example Notification Scripts The following long message notification scripts are examples of the template in Subparagraph F-3b applied to a USACE project and intended to initiate communications with emergency management authorities and the National Weather Service. GUIDANCE elements of the message should be adjusted for public notifications. See “A Guide to Public Alerts and Warnings for Dam and Levee Emergencies” for additional long message examples and for short message examples. When developing short messages, it is important the information is consistent with the information provided in the long messages. It is also important to understand the requirements imposed by and the limitations of systems used to disseminate short messages.

a. Example 1 - Warning

[HEADING] **WARNING Imminent dam breach and imminent high flows, Westville Dam, Southbride, MA**

This is a [SIGNAL] **WARNING** declaration by the [SOURCE] U.S. Army Corps of Engineers (USACE), New England District (CENAE). [THREAT] A breach of the dam

and resulting high flows and major flooding is imminent [LOCATION] at Westville Dam (NID MA00972), Southbridge, MA and areas in the downstream floodplain.

[GUIDANCE] This is a request to immediately initiate emergency response procedures and evacuation plans for threatened areas. USACE, in coordination with Southbridge County Emergency Management, encourages residents of Southbridge, MA within the flood zone to evacuate immediately. This flood zone includes the Southbridge neighborhoods of McKinstry Brook and Cady Brook.

[GUIDANCE] Major flooding can be expected within the floodplain from Westville Dam as far downstream as the city of Norwich, CT. This includes the communities of Southbridge in Massachusetts and Quinebaug, Putnam, Danielson, Jewett City, and Norwich in Connecticut. Additional information is available in the Westville Dam Emergency Action Plan (CENAE, 2012), including appropriate USACE contacts for situational verification. The New England District Emergency Operations Center has been activated. Updates will be provided as available.

[TIME] Flood waters will reach Southbridge, MA less than 30 minutes following the breach. Flood water arrival times for other downstream communities are as follows: Quinebaug (1 hour), Putnam (4 hours), Danielson (9 hours), Jewett City (18 hours), Norwich (20 hours).

b. Example 2 - Watch

[HEADING] **WATCH Potential dam breach and imminent high flows, Westville Dam, Southbridge, MA**

This is a [SIGNAL] **WATCH** declaration by the [SOURCE] U.S. Army Corps of Engineers (USACE), New England District (CENAE). [THREAT] A potential for dam breach due to a progressing seepage condition exists [LOCATION] at Westville Dam (NID MA00972), Southbridge, MA.

[GUIDANCE] This is a request to immediately initiate emergency response procedures and assess the need to evacuate threatened areas. Flooding can be expected along the river floodplains and some low lying areas may need to be evacuated. Additional information is available in the Westville Dam Emergency Action Plan (CENAE, 2012), including appropriate USACE contacts for situational verification. The New England District Emergency Operations Center has been activated. Updates will be provided as available.

[TIME] Discharges from the outlet works of 3,800 cfs will begin at 1100 on Wednesday, January 30, 2015 down the Quinebaug River and will continue through February 5, 2015.

c. Example 3 - Alert

[HEADING] **ALERT Non-breach incident, Westville Dam, Southbridge, MA**

This is an [SIGNAL] **ALERT** declaration by the [SOURCE] U.S. Army Corps of Engineers (USACE), New England District (CENAE). [THREAT] There is no immediate threat to [LOCATION] Westville Dam (NID MA00972), Southbridge, MA.

[GUIDANCE] Signs of distress and/or adverse conditions have been identified along the downstream side of the dam embankment. Additional information is available in the Westville Dam Emergency Action Plan (CENAE, 2012), including appropriate USACE contacts for situational verification. The New England District Emergency Operations Center has been activated. Updates will be provided as available.

[TIME] Normal discharges from the outlet works of 800 cfs are currently in effect and will continue through February 5. Normal flows can be expected along the Quinebaug River through the City of Southbridge, MA during this period of time.

d. The following is an example of a final message without the message components labeled.

****ALERT** Watch cancellation, Westville Dam, Southbridge, MA**

ALERT - The U.S. Army Corps of Engineers (USACE), New England District (CENAE) has cancelled the watch condition at Westville Dam (NID MA00972), Southbridge, MA as the issues that prompted the condition have been resolved..

F-6. A Guide for Public Alerts and Warnings for Dam and Levee Emergencies. “A Guide for Public Alerts and Warnings for Dam and Levee Emergencies,” prepared for the U.S Army Corps of Engineers Risk Management Center, can be referenced at: http://silverjackets.nfrmp.us/Portals/0/doc/WarningGuidebook_USACE.pdf?ver=2015-08-10-213008-520.

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Appendix G

Example Problem Assessment Chart and Notification Flowchart for Dams

EXAMPLE PROBLEM ASSESSMENT CHART

1. BOILS AND PIPING (Seepage Observed at Downstream Portion of Dam)

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Severe Piping/Subsidence. Large boils carrying material at an increasing rate, with a vortex in the reservoir.	(1) All gates should be full open to lower pool level as fast as possible. (2) Locate upstream entrance and attempt to reduce flow. (3) Place inverted filter (App. B figure 2) over downstream outlet of piping. (4) Monitor abutments, dam, and downstream area for seepage, sinkholes, boils, pool vortex, etc.	Size and location of seepage area, time condition noted, flow rate estimate, status and condition of remedial measures.	Reference assessment categories for Reservoir Whirlpool.
Potential Breach Emergency	Piping. Active boils removing material from foundation or embankment and causing subsidence. Cloudy or muddy water and increasing flow rates.	(1) Initiate controlled reservoir drawdown (in accordance with the operations plan). (2) Investigate flow at upstream entrance. (3) Place inverted filter over downstream outlet of piping. (4) Monitor entire embankment continuously.	Size and location of seepage area, time condition noted, flow rate estimate, status and condition of remedial measures.	Distress area is large enough that sandbag dikes will likely be ineffective. Inverted filters are the recommended remedial action.
Non-Breach Emergency	Boils/Heavy Seepage. Concentrated seeps, or boils that stabilize with clear flowing water. Boil activity appears to be limited to shallow strata.	(1) Confer with ED-G branch and control seepage by appropriate remedial measures. Remedial measures may include ringing the area with sandbag or earthen dike, inverted filter over the area, pumping existing relief wells, or installing well points or other new system to relieve subsurface water pressures. (2) Monitor entire embankment frequently.	Size and location of seepage area, time condition noted, flow rate estimate, status and condition of remedial measures.	Many reservoirs have small localized areas of seepage (wet swampy areas) when the reservoir is at multipurpose level. During flood stages, seepage areas must be monitored frequently as outlined in the surveillance plan.
High Flow Emergency	New Seepage. There is a new wet or soft area on downstream embankment slope or vicinity of the embankment toe that is not normal or has not been previously documented.	Observe periodically. Verify seepage water is clear and does not move material. Confer with Geotech Branch (ED-G)	Size and location of seepage area, time condition noted, quantity of puddled water and runoff.	In most cases, minor wet areas are caused by precipitation or controlled seepage during high pool levels. However, serious seepage problems may be detected early by discerning observations.

Note: To be used in conjunction with Notification Flowchart.

EXAMPLE PROBLEM ASSESSMENT CHART

2. RESERVOIR WHIRLPOOL (Seepage Observed at Upstream Portion of Dam)

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Vortex/Piping. Whirlpool caused by piping tunnel in the embankment or abutment. Efforts to control flow failed. Cracking or settlement of crest or embankment slope.	(1) Open all gates to lower pool level as fast as possible. (2) Evacuate danger area, except for essential workers. (3) Attempt to prevent or delay a breach by plugging the upstream entrance. Accessibility may require long reach construction equipment, such as a crane/dragline, or helicopter. Plug material may consist of large rock (including riprap from face of dam), cars, construction equipment, hay bales, bedsprings, rolls of fencing, trees, or any resilient material that can be drawn into the vortex. (4) Search abutments, dam, and downstream of dam for seepage areas, sinkholes, boils, etc.	Time condition noted, location and approximate size of whirlpool, and report on success of attempted corrective measures. Also report downstream seepage conditions.	The embankment between the vortex and the downstream exit is susceptible to catastrophic subsidence, and safety of workers is a concern.
Potential Breach Emergency	Vortex. There is a vortex in the pool associated with water flowing through the embankment or abutment.	(1) Initiate controlled reservoir drawdown (in accordance with the operations plan). (2) Attempt to prevent or delay a breach by plugging the upstream entrance. Plug material may consist of large rock (including riprap from face of dam), cars, construction equipment, hay bales, bedsprings, rolls of fencing, trees, or any resilient material that can be drawn into the vortex. (3) Monitor entire embankment continuously.	Time condition noted, location and approximate size of whirlpool. Also report downstream seepage conditions.	
Non-Breach Emergency	Not Applicable.			
High Flow Emergency	Small whirlpool immediately upstream of intake or spillway gates, with no evidence of unusual seepage downstream.	Observe periodically	None	Large flows through submerged intake or spillway gates frequently cause small whirlpools. This is normal, especially if debris has hung up on the trash rack.

Note: To be used in conjunction with Notification Flowchart.

EXAMPLE PROBLEM ASSESSMENT CHART

3. SINKHOLES

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Not Applicable. Categorize under seepage problems.			
Potential Breach Emergency	(a) Sinkhole is located in vicinity of previous or concurrent piping distress.	(1) Confer with ED-G, identify cause, and locate associated problems. Take corrective actions for seepage problems. (2) Place riprap in sinkhole. (3) Monitor continuously.	Size and location of sink hole, changes in level of slough material or riprap/fill in the sinkhole.	
	(b) Sinkhole is located above outlet works conduit.	(1) Close gates. (2) Inspect conduit for cracks/damage. Coordinate with ED-D and ED-G. (3) Monitory continuously until source is located and inspected.	(1) Sinkhole: Size and location of sink hole, changes in level of slough material or riprap fill. (2) Conduit: Description and size of cracks or damage and seepage quantity estimate.	
Non-Breach Emergency	Sinkhole develops behind stilling basin wall.	Confer with ED-G and establish monitoring program. Verify cause and correct to prevent reoccurrence.	Size and location of sinkhole	
High Flow Emergency	Sinkhole obviously linked to known source, unrelated to seepage (I.e. utility trench backfill, animal burrows, fill over riprap, etc.)	Confer with ED-G and establish monitoring program. Verify cause and correct to prevent reoccurrence.	Size and location of sinkhole. Photograph and document sinkholes larger than 1 cubic foot in file.	

Note: To be used in conjunction with Notification Flowchart.

EXAMPLE PROBLEM ASSESSMENT CHART

4. SLIDES - Upstream or downstream slope of embankment.

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Massive Slope Failure. Deep seated failure mass encompasses the dam crest, and remnant embankment is expected to slump below pool level.	(1) Open all gates to lower pool level as fast as possible. (2) Attempt to prevent or delay a breach by constructing a downstream stability berm, relieving seepage pressure, and maintaining freeboard. (3) Monitor continuously.	Location, time first noticed, water emergence on slope, pool elevation. Monitor lateral offset and crest elevation with periodic readings.	Borrow material from embankment section or abutment as necessary to avoid overtopping. Avoid unnecessary weight addition to upper portion of failure mass. Consider benching the failure mass to rapidly increase passive resistance and reduce active force.
Potential Breach Emergency	Slope Failure Threatens the Embankment Core. Deep seated failure mass encompasses the dam crest, but remnant embankment maintains 10 feet freeboard above pool.	(1) Initiate controlled reservoir drawdown (in accordance with the operations plan). (2) Construct stability berm on the downstream toe of the slide. (3) Establish a monitoring program.	Location, time first noticed, water emergence on slope, pool elevation. Monitor offset with periodic readings.	Stage material and use equipment standby.
Non-Breach Emergency	Small Localized Slide or Longitudinal Cracking. Crack has formed near the crest, or on the embankment slopes. The crack is open or there is vertical offset.	Confer with ED-G and investigate cause.	Crack aperture, length, growth rate, location, offset, and observation times.	The cause is unknown or there is potential expansion.
High Flow Emergency	Shallow Sloughing of Topsoil or Riprap. Slide does not threaten the embankment core or crest height, and the cause has been determined. The cause is not related to seepage from the reservoir.	(1) Coordinate repair work with ED-G. (2) Confirm extent of failure zone. (3) Observe periodically.	Location, time first noticed, water emergence on slope, pool elevation. Monitor offset with periodic readings.	Slide does not pass through crest and does not extend into the embankment more than 10 feet (measured perpendicular to the slope).

Note: To be used in conjunction with Notification Flowchart.

EXAMPLE PROBLEM ASSESSMENT CHART

5. LIQUEFACTION - Earthquakes/Seismic Events

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Not Applicable. Categorize under slides or other distress.			
Potential Breach Emergency	Earthquake & Slope Failure. Liquefaction has initiated a slope failure with deep seated movement.	(1) Initiate controlled reservoir drawdown (in accordance with the operations plan). (2) Construct stability berm on the downstream toe of the slide. (3) Establish a monitoring program.	Monitor and report details for all other forms of distress.	Stage material and use equipment standby. Consider risk of after-shock (potential for continued movement)
Non-Breach Emergency	Liquefaction. Significant earthquake occurred. There is evidence of foundation liquefaction. There may be evidence of embankment cracking, bulging, settlement, or displacement.	(1) Monitor continuously during period at risk for after-shocks. (2) Consider mobilizing equipment on standby.	Monitor and report details for all other forms of distress.	Evidence of liquefaction consists of sand boils, concentrated seeps &/or elevated piezometric levels occurring after a seismic event.
High Flow Emergency	Tremors. There was a minor seismic event well below the expected damage threshold for the project.		Monitor and report. Consider supplemental annual inspection.	

Note: To be used in conjunction with Notification Flowchart.

EXAMPLE PROBLEM ASSESSMENT CHART

6. EMBANKMENT CRACKING - Transverse Cracking (See Slides for longitudinal cracking)

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Crack Erosion. Leakage intensity is increasing. Crack erosion will initiate formation of a breach. Remedial measures have been ineffective.	(1) Open all gates to lower pool level as fast as possible. (2) Attempt to prevent or delay a breach by plugging or replugging the upstream entrance.	Location, aperture, depth sounding, orientation to crest, pattern/linearity, continuity, pool elevation.	
Potential Breach Emergency	Water Leakage Through Crack. Crack extends completely through dam. Water is passing through the crack. Erosion of the crack can be prevented or leakage can be plugged with available resources.	(1) Initiate controlled reservoir drawdown (in accordance with the operations plan). (2) Plug the upstream entrance. Confer with ED-G branch to use appropriate filter materials to minimize failure potential of the plug. (3) Seal crack.	Location, aperture, depth sounding, orientation to crest, pattern/linearity, continuity, pool elevation.	
Non-Breach Emergency	Open and Continuous Crack. Crack extends completely through dam. Lake level and forecast levels are below base of crack.	Coordinate with ED-G. Trenching and backfilling or other means of filling the crack will be required after the extent of the crack is determined. Observe constantly until repair work is completed.	Location, aperture, depth sounding, orientation to crest, pattern/linearity, continuity, pool elevation.	Large open cracks may be associated with slides, liquefaction, or advanced seepage distress.
High Flow Emergency	Discontinuous Crack. Minor crack in crest that does not extend completely through the dam, or minor cracking on the embankment surface.	Observe periodically. Report to Geotechnical Branch (ED-G)	Location, aperture, depth sounding, orientation to crest, pattern/linearity, continuity, pool elevation.	Random and transverse cracks can develop during extended dry periods due to desiccation and shrinkage of the soil.

Note: To be used in conjunction with Notification Flowchart.

EXAMPLE PROBLEM ASSESSMENT CHART

7. EROSION - Embankment Slope Protection, Stilling Basin, or Spillway

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Extensive erosion is threatening a slide failure that would result in overtopping the dam.	Attempt to place rock from emergency stockpile. May need helicopter, dragline, or long reach equipment. Adjust outlet or spillway releases.	Photographs, dimensions of ground loss, pool & tailwater levels, conduit and spillway discharges, and wind conditions.	Erosion below water line could cause sudden slides, and is dangerous to personnel and equipment.
Potential Breach Emergency	Embankment revetment or stilling basin lining is displaced during flood conditions. Erosion is evident by caving or ground loss. Progressive erosion threatens dam failure.	Place rock from emergency stockpile. May need dragline, or long reach equipment. Consider self launching rock berms. Adjust outlet or spillway releases.	Photographs, dimensions of ground loss, pool & tailwater levels, conduit and spillway discharges, and wind conditions.	Erosion below water line could cause sudden slides, and is dangerous to personnel and equipment.
Non-Breach Emergency	Embankment revetment or stilling basin lining is displaced. Erosion is evident by caving or ground loss.	Place rock and bedding from emergency stockpiles. Adjust outlet or spillway releases.	Location and dimensions of distress, pool & tailwater levels, conduit and spillway discharges, and wind conditions.	Approach cautiously and check for erosion below waterline.
High Flow Emergency	Observed distress to riprap or revetments while under normal pool level and outflow conditions.	(1) Coordinate repair work with ED-G. (2) Confirm extent of failure zone. (3) Observe periodically.	Location and dimensions of distress, wave action associated with cause.	

Note: To be used in conjunction with Notification Flowchart.

EXAMPLE PROBLEM ASSESSMENT CHART

8. EMBANKMENT OVERTOPPING

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Flow over dam causing severe erosion of crest and downstream slope.	Lower lake level as fast as possible. If possible, plug the upstream end of the erosion with anything large enough to be held in place. Follow with progressively smaller material to reduce flow. Upon reduction of flow, armor the crest and increase freeboard. Utilize emergency filter fabric on crest and downstream slope, hold in place with sandbags. Observe constantly.	Use critical surveillance portion of EAP.	Inform and coordinate with downstream stakeholders.
Potential Breach Emergency	Pool levels in freeboard zone. Erosion of crest and/or downstream slope from seepage and wave wash.	Lower lake level as fast as possible. If possible, armor the crest and restore freeboard. Utilize emergency filter fabric if sheet flow, raise elevation with sandbags if concentrated flow. Observe constantly.	Use critical surveillance portion of EAP.	Inform and coordinate with downstream stakeholders.
Non-Breach Emergency	Reservoir flooding. Forecast lake level in surcharge pool, or emergency spillway release.	Implement Critical Surveillance Phase of Dam Surveillance Plan. Follow forecasts and consider staging emergency resources.	Use critical surveillance portion of EAP.	Inform and coordinate with downstream stakeholders.
High Flow Emergency	Reservoir flooding. Forecast lake level in critical surveillance.	Monitor pool rise. Coordinate releases with ED-HC. Notify ED-GD when lake goes into Increased and Critical surveillance levels.	Use critical surveillance portion of EAP.	Inform and coordinate with downstream stakeholders.

Note: To be used in conjunction with Notification Flowchart.

EXAMPLE PROBLEM ASSESSMENT CHART

9. STRUCTURAL DEFORMATION

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Not Applicable. Categorize under seepage problems.			
Potential Breach Emergency	Obvious movement of gravity structures, global movement including foundations, or movement of large monoliths that is associated with developing seepage problems.	Lower pool. Mitigate downstream problems in accordance with seepage problems. Locate and plug seepage entrance point if possible.	Location, gap, width, length, seepage flow, sediment quantity, sediment description, equipment or utility malfunctions.	Frequent monitoring to detect changes in rate of movement.
Non-Breach Emergency	Relative movement of monoliths, towers, or like components. Separation from adjoining structure. There is sediment discharging from crack. Seepage is increasing or water is muddy.	Coordinate with ED-D and ED-G. Plug holes or cracks, if possible, to prevent seepage. Observe constantly.	Location, gap, width, length, seepage flow, sediment quantity, sediment description.	Set up monitoring points for accurately detecting further movement.
High Flow Emergency	Measureable movement that is not increasing, seepage is minor, and no sediment loss.	Coordinate any necessary repair work with ED-D and ED-G. Observe periodically.	Location, gap, width, length, seepage flow.	Movement may be visually noted by vertical or horizontal offsets, gaps, or items out of plumb.

Note: To be used in conjunction with Notification Flowchart.

EXAMPLE PROBLEM ASSESSMENT CHART

10. CRACKS IN CONDUIT/STRUCTURES/BURIED COLLECTOR SYSTEMS

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Not Applicable. Categorize under seepage problems.			
Potential Breach Emergency	Seepage increasing and carrying embankment material. Abnormally muddy water flowing from conduit. Seepage is significant such that area may not be accessible for inspection.	Lower Pool. Evaluate accessibility to the distress area. Coordinate with District Office.	Location, width, length, water flow, sediment quantity, sediment description.	Location of crack may affect categorization. Coordinate with District Office.
Non-Breach Emergency	New Crack noticed or existing crack opened. There is sediment discharging from crack. Seepage is increasing or water is muddy.	Coordinate temporary repairs with ED-DS. Plug crack to the extent possible with oakum or other suitable material until temporary repairs can be made. Material should be larger than the crack width.	Location, width, length, water flow, sediment quantity, sediment description.	Location of crack may affect categorization. Coordinate with District Office. Cracks in conduit are generally < 1/4 inch and are not changing.
High Flow Emergency	There is no sediment discharged from crack. Seepage is constant and water clear.	Observe periodically. Inform ED-DS when new cracks are noticed.	Location, width, length, water flow, sediment quantity, sediment description.	Cracks are generally closed, and induced by volume changes in structure, not by overstress.

Note: To be used in conjunction with Notification Flowchart.

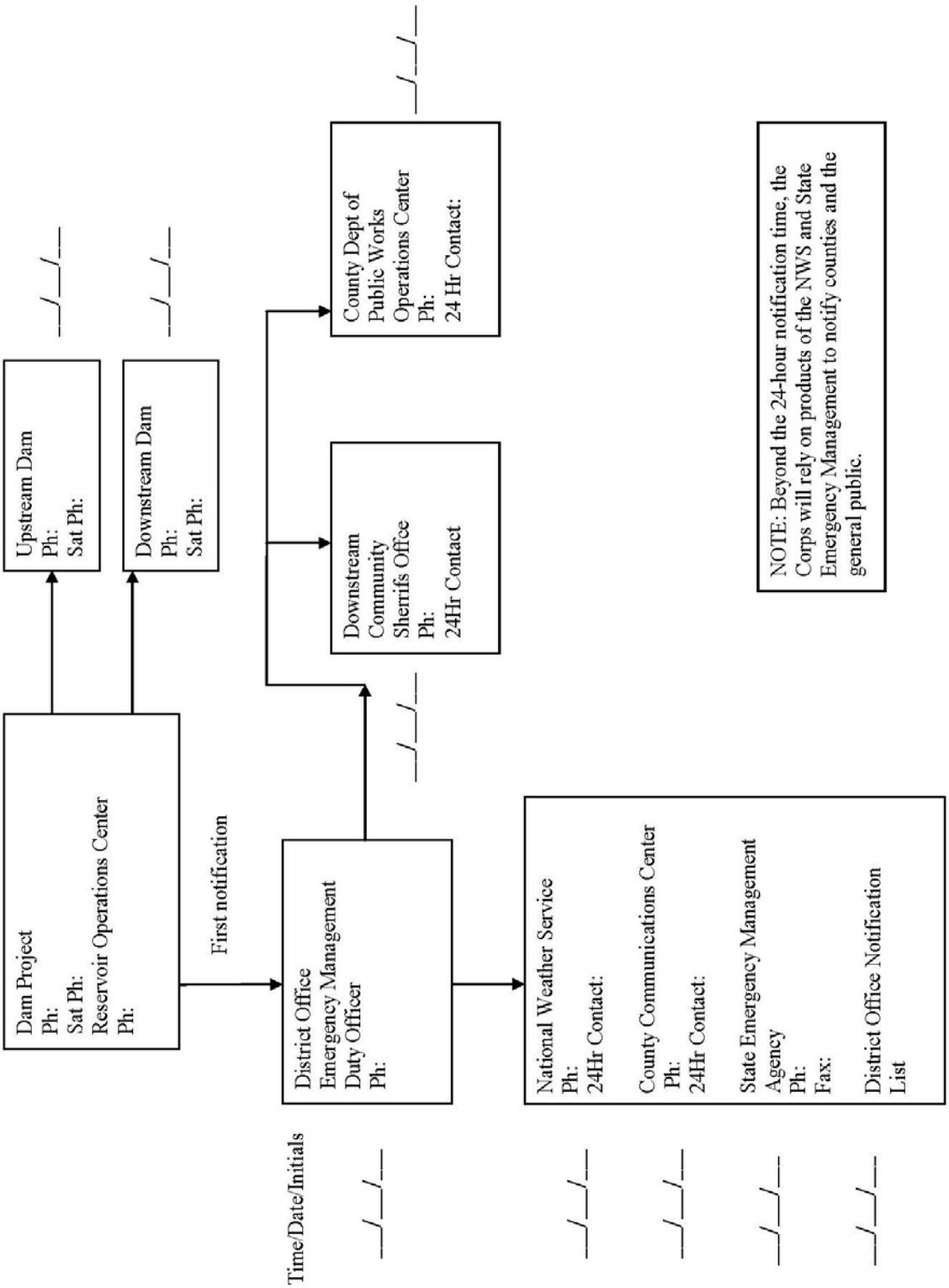
EXAMPLE PROBLEM ASSESSMENT CHART

11. RELIEF WELLS

Category	Problem (Mechanism and Common Observations)	Corrective Action (Remedial Measures)	Data to be Reported	Remarks
Imminent Breach Emergency	Not Applicable. Categorize under seepage problems.			
Potential Breach Emergency	During flood conditions, sediment is being discharged through collector pipe outlet or around relief well(s) and cannot be stopped. Sediment quanitity is significant, indicating piping of foundation material.	Attempt to locate which well is discharging material. Pump adjacent wells to reduce flow from affected well to reduce or eliminate material beign carried by flow. Treat similar to Boils and Piping Distress.	Contact EOC report steps taken to ED-G. Report flowrate and description of discharge material.	ED-G may direct project office to abandon well in accordance with District specs.
Non-Breach Emergency	Discharge from collector pipe cloudy to muddy with material being discharged at outlet. Sediment quanitity is significant, indicating piping of foundation material.	Attempt to locate which well is discharging material. Pump adjacent wells to reduce flow from affected well to reduce or eliminate material beign carried by flow.	Contact EOC report steps taken to ED-G. Report flowrate and description of discharge material.	ED-G may direct project office to abandon well in accordance with District specs.
High Flow Emergency	Discharge from collector pipe cloudy to muddy with material being discharged at outlet. Sediment quanitity is minimal, indicating filter development around well.	Attempt to locate which well is discharging material. Monitor discharge by collecting water in bucket.	Contact EOC report steps taken to ED-G. Report flowrate and description of discharge material.	ED-G may direct project office to abandon well in accordance with District specs.

Note: To be used in conjunction with Notification Flowchart.

Notification Flowchart



Appendix H

Example U.S. Army Corps of Engineers Emergency Action Plan Map Standard

INUNDATION ELEMENTS were created from the modeling effort for this study. Floodplain boundaries (Normal High Pool and Maximum Inundation Areas) were computed using one dimensional HEC-RAS software from the USACE Hydrologic Engineering Center unless otherwise noted. More information regarding modeling methods used in this study is provided in the study report.
Date of model creation: Month YEAR.
Model Approved by: [Model Technical Lead], P.E., MMC Technical Lead

Reference mile points indicate mileage downstream from the study dam along the modeled stream centerline.

FAILURE WAVE ARRIVAL TIME
Failure wave arrival is calculated as the time at which the difference between the hydrograph from the failure simulation and the hydrograph from the corresponding non-failure simulation exceeds 2 feet. Failure wave arrival time points denote the elapsed time following initial dam breach, until increased flow directly resulting from dam breach arrives at a given location.

FAILURE WAVE DATA TABLES reflect data from model output at locations on the map sheet. For 1D HEC-RAS models, data is calculated at the cross section shown on the map, these cross sections are selected from the model cross sections to represent the flow on each map sheet that intersects with the model centerline. For 2D models, data included in the failure wave data table reflect the model output at the model element location denoted on the maps by the lettered point.

READING FACING PAGE GRAPHS
The graphs located on the pages adjacent to map sheets depict the inundation along the stream centerline as interpolated between model cross sections. The areas on the graphs are created at specific times throughout model run-time as shown in the legend and show the progression of the failure wave downstream from left to right on the graph.

The X axis of the graphs represents reference miles, or miles along the stream centerline downstream of the study dam. Water surface elevation is shown on the Y axis.

The gray polygon (Flow at Dam Break) represents the water surface at the time of failure, not at the initial timestep of the model. It may represent flooding caused by increased releases prior to failure.

Multiple sheets may be represented on the graph, dotted vertical lines represent the sheet boundaries as they intersect the stream centerline. All lettered cross sections that appear in the maps also appear in the profile graphs at the reference mile location they occupy in the maps.

Structure points that appear on the graphs do not depict actual real-world structures and are only used to depict the density of structures at a given reference mile and elevation range.

Infrastructure points shown on the graphs are shown at approximate elevations and reference miles (distance from the stream centerline is not taken into account).

BASEMAP ELEMENTS
The source of most BASEMAP ELEMENTS is USACE CorpsMap data, which is a compilation of prominent nationwide datasets. Below are the nationwide datasets used for the source of base map data and the layers extracted from each:

-Homeland Security Infrastructure Program (HSIP): Airports, Broadcast Communications, Chemical Industries, Colleges and Universities, Correctional Facilities, Electric Substations, Emergency Medical Services, Firestations, Fossil Fuel Electric Power Generation and Other Power Generation, Heliports, Hospitals, Hydroelectric Power Generation, Intermodal Shipping Facilities, Law Enforcement, Natural Gas Storage, Nuclear Electric Power Generation, Nuclear Fuel Manufacturing, Pipelines, Petroleum Bulk Stations and Terminals, Schools, Wastewater Treatment Plants, Railways and Municipality Boundaries.

-Environmental Systems Research Institute (ESRI): County, State, and International boundaries.

-FEMA Hazus data 2012 release: Potable Water Facilities.

-USACE AGC National Inventory of Dams (NID): USACE Dams, and Non-USACE Dams.

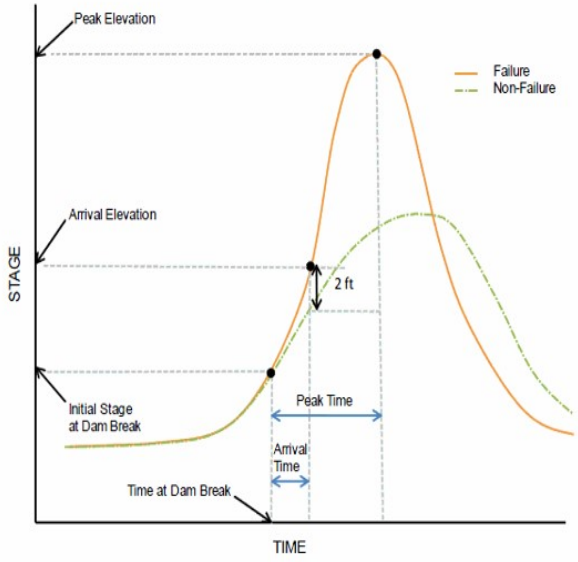
-National Levee Database (NLD): Closure Structure Lines, Floodwall Lines and Levee Centerlines.

-National Geospatial-Intelligence Agency (NGA): MGRS/USNG Grid

-United States Geological Survey (USGS): River Gages

-SHEET INDEX map sheets are derived from the USGS 7.5' Quadrangle Index.

Calculation of Failure Wave Data Tables
Example



ABC Dam Pertinent Project Data

Physical Data (ft, NAVD 88)						
Dam Type		Earth				
Dam Length (ft)		2,100				
Top of Dam Elevation		430.3				
Spillway Crest Elevation		412.7				
Spillway Type		Uncontrolled				
Spillway Width (ft)		170				
No. of Spillway Gates & Dimensions		None				
Outlet Structure Description		Slide/Sluice Gate (3 - 3.5'x7' Gates, 1 - 8' Circular Conduit)				
Hydrology (ft, NAVD 88)						
Drainage Area (sq mi)		62				
PMF Pool Elevation		429.5				
Max. Historic Pool Elevation		415.1 (5/7/1992)				
Hydrologic Loading Condition	**Antecedent Elevation (ft, NAVD 88)**	**Peak Elevation (ft, NAVD 88)**	**Inflow Hydrograph**	**Peak Inflow (cfs)**	**Peak Failure Outflow (cfs)**	**Storage (acre-ft)**
Maximum High Pool	418.7	430.1	PMF	60,000	1,002,100	130,000
Normal High Pool (10% Duration)	355.3	345.4	460 cfs	460	11,100	1,500
Vertical Datum Adjustment (ft NGVD 29 to (ft NAVD 88))		-0.6				

STUDY AREA SPECIFIC MAPPING NOTES FOR ABC DAM

ABC Dam is positioned 25 miles southeast of City Z, or 90 miles south of City Y on the east side of the state. The project operates for flood regulation, irrigation, navigation, and downstream water quality.

ABC Dam is a major tributary of River 1, and flows into the main stem from the north, which is approximately 18 river miles upstream of River 2.

The 2013 MMC Dam XYZ model was used as the base model, with geometric updates to the River 1 reach, based on newer overbank and channel data.

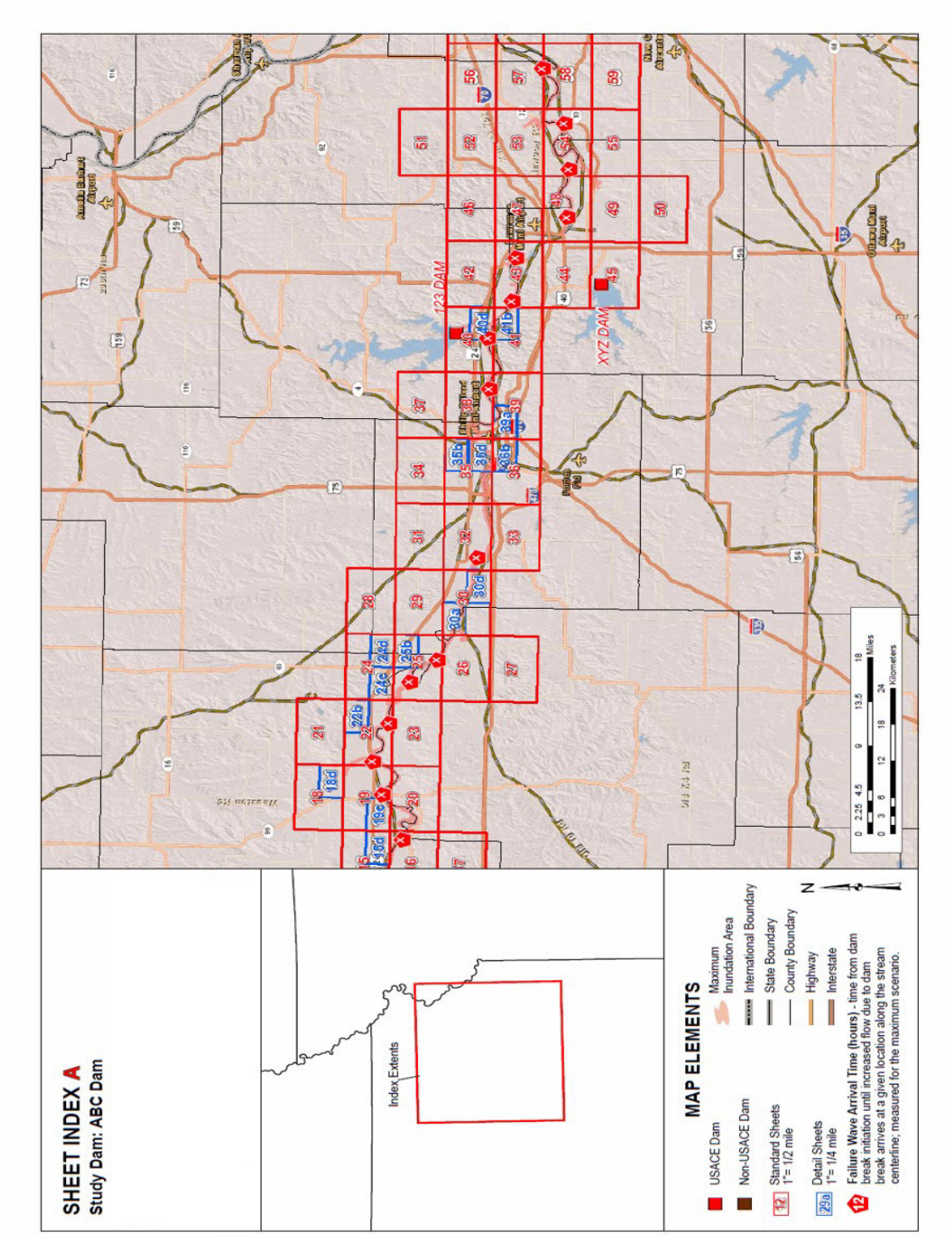
Due to the very wide one-dimensional cross sections in the model areas on the west side of City Z show inundation prior to overland flow coming from River 3. These areas will likely compute consequences not directly attributable to high River 2 flows and stages for certain MMC simulations. For dam failure simulations above the normal high pool failure, these same areas are appropriately inundated.

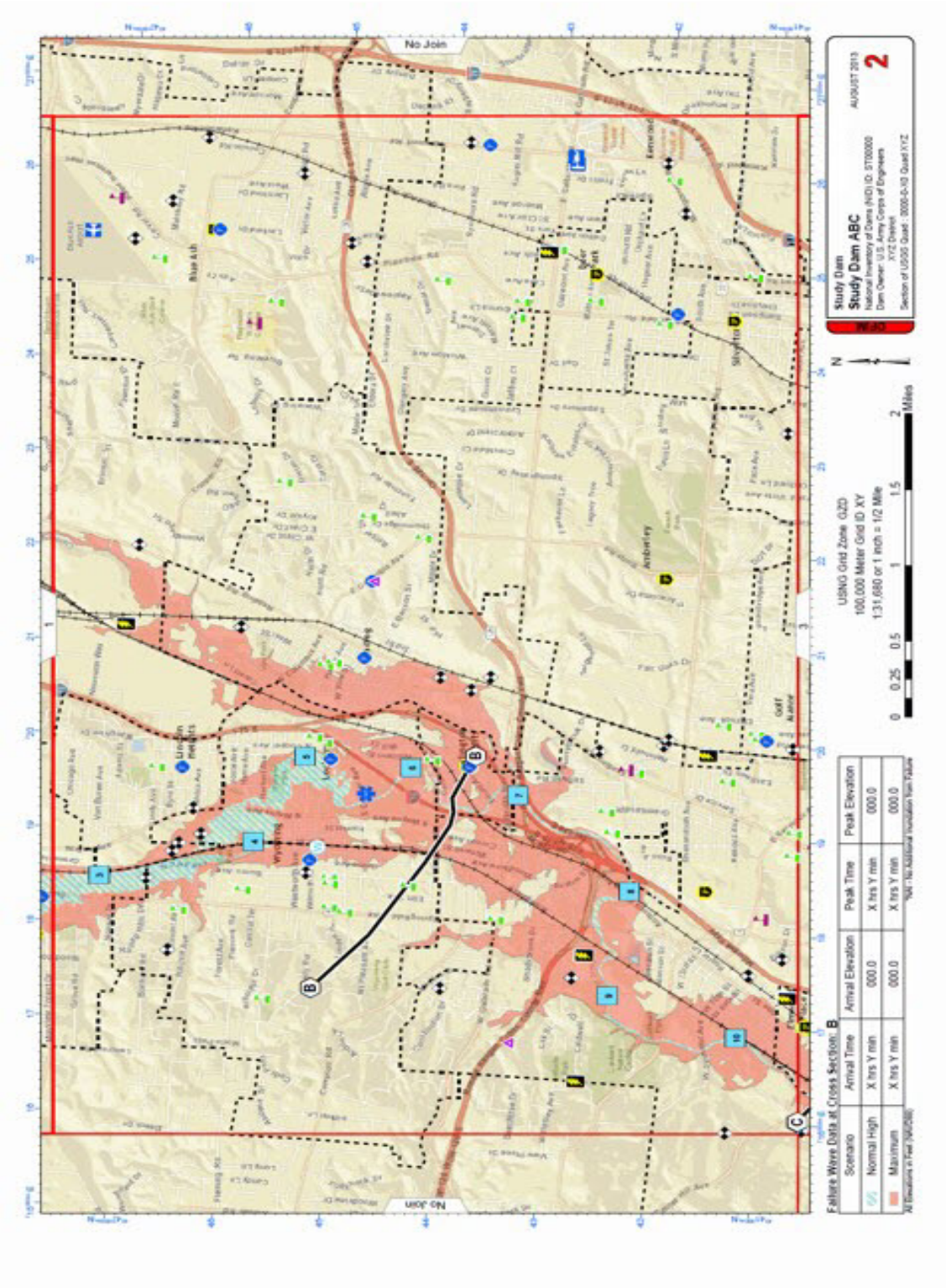
Downstream residual flows are required by the model for computational purposes. For all but the maximum high pool scenario, an estimate of the average annual flow was used, provided that it did not exceed channel capacity. For the maximum high pool scenario, the inflows from the same three modeled reaches were increased to estimate the highest non-damaging flows along each reach, as indicated in the water control manual.

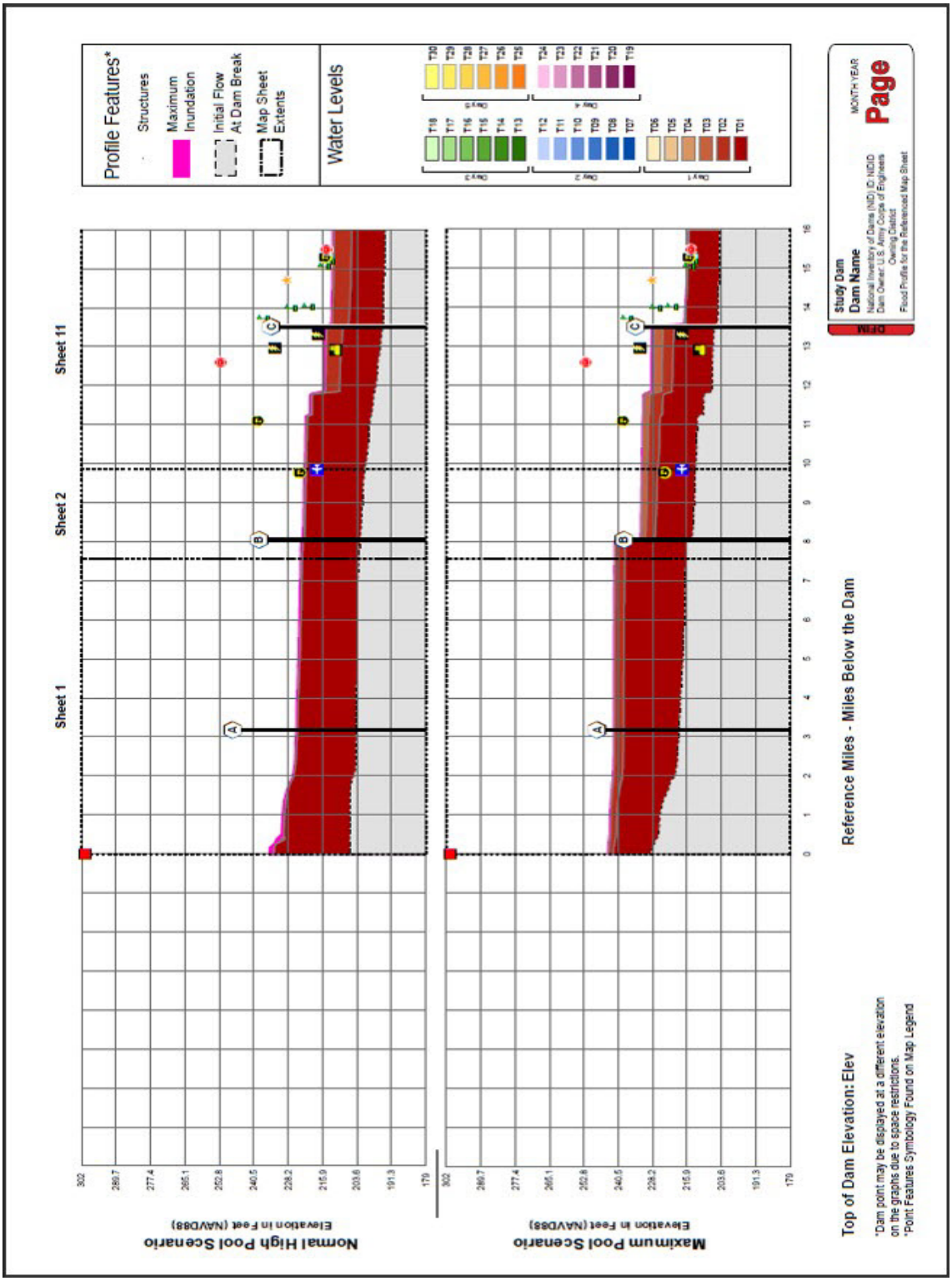
ABC Dam - NIDID

Cross Section	RAS Model			Normal High				Max High					Reference
Letter	RiverCode	ReachCode	Station	Arrival Time	Arrival Elevation	Peak Time	Peak Elevation	Arrival Time	Arrival Elevation	Peak Time	Peak Elevation	Sheet No.	Mile
A	River 1	Reach 1	3.11	0 hrs 31 min	603.6	1 hrs 9 min	649.1	0 hrs 33 min	622.2	1 hrs 9 min	652.1	1	3.82
B	River 2	Reach 2	197.09	1 hrs 5 min	533.7	1 hrs 34 min	567.5	1 hrs 0 min	549.4	1 hrs 34 min	570.4	2	8.86
C	River 2	Reach 2	191.75	1 hrs 43 min	478.6	2 hrs 15 min	511.4	1 hrs 34 min	494.7	2 hrs 9 min	515.6	3	14.24
D	River 3	Reach 3	184.43	2 hrs 36 min	428.2	5 hrs 24 min	448.0	2 hrs 49 min	442.5	5 hrs 15 min	451.2	4	20.68
E	River 3	Reach 3	178.89	3 hrs 41 min	389.3	10 hrs 4 min	400.1	6 hrs 36 min	399.9	10 hrs 0 min	403.7	6	26.22
F	River 3	Reach 3	174.88	9 hrs 22 min	363.9	14 hrs 15 min	374.3	9 hrs 59 min	375.0	13 hrs 0 min	377.3	8	30.31
G	River 3	Reach 3	171.83	10 hrs 3 min	336.1	17 hrs 49 min	352.6	12 hrs 24 min	354.3	15 hrs 15 min	356.0	11	33.39
H	River 3	Reach 3	165.01	11 hrs 32 min	305.0	22 hrs 39 min	319.2	15 hrs 19 min	321.5	19 hrs 30 min	324.4	14	39.27
I	River 3	Reach 3	161.46	12 hrs 33 min	287.0	25 hrs 4 min	299.1	18 hrs 28 min	301.5	22 hrs 4 min	302.6	15	43.83
J	River 3	Reach 3	153.97	13 hrs 55 min	265.4	28 hrs 15 min	274.9	20 hrs 27 min	277.5	24 hrs 0 min	278.7	18	51.35
K	River 3	Reach 3	148.42	18 hrs 5 min	245.3	30 hrs 30 min	249.9	22 hrs 2 min	252.6	26 hrs 19 min	254.6	19	57.91
L	River 3	Reach 3	141.36	18 hrs 55 min	227.6	32 hrs 45 min	233.7	24 hrs 39 min	236.3	28 hrs 9 min	237.3	21	63.98
M	River 3	Reach 3	137.47	21 hrs 28 min	215.9	36 hrs 0 min	222.9	25 hrs 11 min	225.8	30 hrs 0 min	228.3	23	67.89
N	River 3	Reach 3	132.26	22 hrs 44 min	210.3	37 hrs 39 min	217.6	27 hrs 53 min	220.3	31 hrs 24 min	221.4	25	73.06
O	River 3	Reach 3	127.48	27 hrs 7 min	201.5	39 hrs 45 min	206.3	28 hrs 17 min	209.3	33 hrs 39 min	211.5	26	77.85
P	River 3	Reach 3	124.08	29 hrs 2 min	191.3	42 hrs 54 min	199.0	28 hrs 56 min	202.8	35 hrs 34 min	207.3	29	82.25
Q	River 3	Reach 3	118.03	29 hrs 14 min	174.3	45 hrs 54 min	188.0	30 hrs 41 min	192.2	37 hrs 39 min	196.7	28	88.30
R	River 3	Reach 3	114.11	30 hrs 17 min	172.5	47 hrs 4 min	183.8	31 hrs 47 min	188.1	38 hrs 15 min	191.5	30	91.22
S	River 3	Reach 3	109.99	32 hrs 39 min	169.0	48 hrs 15 min	176.3	32 hrs 42 min	180.5	40 hrs 9 min	183.3	32	94.34
T	River 3	Reach 3	107.08	34 hrs 35 min	164.5	49 hrs 54 min	170.8	34 hrs 58 min	174.8	41 hrs 19 min	177.7	33	98.25

*NAI No additional inundation


SHEET INDEX A
Study Dam: ABC Dam
Index Extents
MAP ELEMENTS
USACE Dam
Non-USACE Dam
Standard Sheets 1"= 1/2 mile
Detail Sheets 1"= 1/4 mile
Failure Wave Arrival Time (hours) - time from dam break initiation until increased flow due to dam break arrives at a given location along the stream centerline, measured for the maximum scenario.
Maximum Inundation Area
International Boundary
State Boundary
County Boundary
Highway
Interstate
N
123 DAM
XYZ DAM
Miles
Kilometers


No Join
No Join
Study Dam
Study Dam ABC
National Inventory of Dams (NID) ID: ST00000
Dam Owner: U.S. Army Corps of Engineers
Section of USGS Quad : 30000-A-NE Quad XYZ
AUGUST 2013
2
N
USING Grid Zone (UZ)
100,000 Meter Grid ID: XY
1:31,680 or 1 inch = 1/2 Mile
0 0.25 0.5 1 1.5 2 Miles
Failure Wave Data at Cross Section: B
Scenario
Arrival Time
Arrival Elevation
Peak Time
Peak Elevation
Normal High
X hrs Y min
000.0
X hrs Y min
000.0
Maximum
X hrs Y min
000.0
X hrs Y min
000.0
All Elevations in Feet (NAVD88)
Note: No Additional Inundation from Failure


Profile Features*
Structures
Maximum Inundation
Initial Flow At Dam Break
Map Sheet Extents
Water Levels
Study Dam
Dam Name
MONTH YEAR
Page
Sheet 1
Sheet 2
Sheet 11
Normal High Pool Scenario
Elevation in Feet (NAVD88)
Maximum Pool Scenario
Elevation in Feet (NAVD88)
Reference Miles - Miles Below the Dam
Top of Dam Elevation: Elev
*Dam point may be displayed at a different elevation on the graphs due to space restrictions.
*Point Features Symbology Found on Map Legend

Appendix I

Acronyms

AR	Army Regulation
AAR	after action review
CAT	Crisis Action Team
CENAE	U.S. Army Corps of Engineers, New England District
cfs	cubic feet per second
CMT	Crisis Management Team
DoDM	Department of Defense Manual
DHS	Department of Homeland Security
DSAC	Dam Safety Action Classification
DSAT	Dams Sector Analysis Toolkit
DSO	Dam Safety Officer
DSPM	Dam Safety Program Manager
DSPMT	Dam Safety Program Management Tool
EAP	Emergency Action Plan
EC	Engineer Circular
E&C	Engineering and Construction
EOC	Emergency Operation Center
EM	emergency manager
EMS	emergency medical services
EP	Engineer Pamphlet
ER	Engineer Regulation
FCCE	Flood Control and Coastal Emergencies
FEMA	Federal Emergency Management Agency
FIM	flood inundation mapping
FOUO	For Official Use Only
GIS	Geographic Information System
HIFLD	Homeland Infrastructure Foundation-Level Data
HQ	headquarters
HSEEP	Homeland Security Exercise and Evaluation Program
IDF	inflow design flood
LSAC	Levee Safety Action Classification

LSO	Levee Safety Officer
LSPM	Levee Safety Program Manager
MMC MCX	Modeling, Mapping and Consequences Production Center
MSC	Major Subordinate Command
NDSRB	National Dam Safety Review Board
NGA	National Geospatial-Intelligence Agency
NID	National Inventory of Dams
NIDID	National Inventory of Dams Identification
NIMS	National Incident Management System
NLD	National Levee Database
NWS	National Weather Service
O&M	Operations and Maintenance
PIO	Public Information Officer
POC	point of contact
PL	Public Law
SIR	Serious Incident Report
SITREP	Situational Report
TTX	tabletop exercise
UOC	USACE Operations Center
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code

GLOSSARY

Terms

Breach - The formation of a gap in the dam or levee system through which water may flow uncontrolled. A breach may occur prior to or subsequent to overtopping.

Consequences - The effect, result, or outcome of inundation as reflected in the potential life losses, economic losses, and adverse environmental impacts.

Crisis Action Team - Individuals responsible for enacting crisis level responses.

Crisis Management Team - Provides support through management of crisis level issues, managing additional risks and exposures, and management of stakeholder interests in response to an event or disaster.

Dam - An artificial barrier, including appurtenant works, constructed for the purpose of storage, control, or diversion of water.

Data Owned by Others - Includes vendor-supplied base maps or imagery, census blocks, Homeland Infrastructure Foundation-Level Data (HIFLD) critical infrastructure data, or similar data that are developed and maintained by others. Data owned by others cannot be released by USACE. Requests for data owned by others should be referred to the agency that is the proponent for the data.

Editable (dynamic) Data - Includes inundation boundaries as geospatial vector data for geographic information system software; other model-derived map layers such as cross sections, depths, flood wave arrival time and maximum elevation values, and reference mile marks; USACE-owned base maps or imagery and electronic file formats that present such data in common geospatial visualization tools such as geographic information systems (GIS) and Google Earth.

Emergency Action Plan (EAP) - A formal document that identifies potential emergency conditions at a project and specifies pre-planned actions to be followed in order to reduce consequences of the emergency.

Emergency Action Plan Map - An inundation map depicting specific breach or non-breach scenarios for a project and included within an EAP.

Emergency Level - A category assigned to an emergency situation at a dam or levee to define the primary goal of the emergency response. USACE uses four different emergency levels for dams and levees: non-emergency, non-breach emergency, potential breach emergency, and imminent breach emergency.

For Official Use Only (FOUO) - Information that is not publicly releasable, but may be shared on a need to know basis.

Hazard - something that causes the potential for an adverse consequence.

High Flow Operational Release - Controlled or uncontrolled release that would require communication with downstream stakeholders per project water control manual.

Incident - An event occurring at a dam or levee that could potentially result in a dam or levee safety issue.

Incremental Flood Risk - The flood risk associated with the three inundation scenarios of breach prior to overtopping, overtopping with breach, and component malfunction for a dam or levee.

Intervention - Actions taken to detect a developing failure mode and actions taken to prevent breach due to that failure mode.

Inundate/inundation - In the context of dams and levees, this refers to the flooding of an area.

Inundation Map - An inundation map shows either the actual or predicted extent of flood water within an area for future pre-determined flood events, ongoing flood events, or past flood events.

Levee or Levee System - A levee system comprises one or more earthen embankment or floodwall reaches and other features, such as closure structures and pumping stations, which function collectively to provide a certain level flood risk reduction to a defined area.

Life safety (life-safety risk) - A measure of the probability and severity of life loss resulting from inundation of the area associated with a dam or levee.

Non-breach Flood Risk - The flood risk associated with a dam or levee for the overtopping without breach scenario.

Non-editable (static) Data - Includes both hardcopy, Adobe portable document format (PDF), or other digital image format that cannot be readily manipulated.

Overtopping - A condition that occurs when the elevation of the still-water level and/or associated waves, wind setup, or surge exceeds the top of the dam or levee system.

Potential Failure Mode - A potential failure mode is a mechanism that once initiated potentially could progress to breach of a dam or levee system or inundation of the leveed area. It is noted that overtopping without breach (non-breach) is not called a potential failure mode.

Project - One or more dam or levee systems that are included in an Emergency Action Plan.

Risk - Measure of the probability and severity of undesirable consequences.

Risk assessment - A risk assessment is a systematic, evidence based approach for quantifying and describing the nature, likelihood, and magnitude of risk associated with the current condition and the same values resulting from a changed condition due to some action.

Seminar - An informal discussion, designed to orient participants to new or updated plans, policies, or procedures. Seminars should include internal discussions as well as coordination with emergency management authorities and other organizations with a role in EAP implementation.

Sensitive Information - Information that could pose a security risk or aid those intending to do harm to a USACE project.

Stakeholders - Those individuals or groups responsible, interested, or affected by a particular action or activity.

Supporting (model) Data - Includes generic geospatial information files that support model development and used to develop data for the inundation maps. This includes the hydrologic and hydraulic models and model source data such as digital terrain data and river bathymetry data.

Tabletop Exercise - A tabletop exercise involves key personnel discussing simulated scenarios in an informal setting. Tabletop exercises can be used to assess plans, policies, and procedures.

Workshop - A workshop resembles a seminar but is used to build specific products, such as a draft plan or policy.