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Engineering and Design
USACE LEVEE SAFETY PROGRAM

1. Purpose. This document establishes the policies for implementing the U.S. Army Corps of Engineers (USACE) Levee Safety Program, and describes USACE activities, roles, and responsibilities for federally authorized levees. This document also describes activities that sponsors are required to conduct or participate in consistent with their project agreements.

2. Applicability. This Engineer Circular mainly applies to federally authorized levees, but other USACE programs and authorities may reference or use USACE Levee Safety Program procedures to meet the technical aspects of their program.

3. Distribution Statement. Approved for public release. Distribution is unlimited.

4. References. List of references included in Appendix A.

5. Records Management (Recordkeeping) Requirements. Records management requirements for all record numbers, associated forms and reports required by this regulation are included in the Army's Records Retention Schedule - Army. Detailed information for all record numbers, forms, and reports associated with this regulation are located in the Army's Records Retention Schedule - Army at https://www.arims.army.mil/arims/default.aspx.

FOR THE COMMANDER:

8 Appendixes

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Chapter 1
Background

1-1. Preface.

a. Levee safety is one piece of overall flood risk management and includes managing and reducing potential flood damage and loss of benefits associated with levee systems. The goal of levee safety is to ensure that levee systems provide benefits to those living and working behind them. It is accomplished by the U.S. Army Corps of Engineers (USACE) and levee sponsors working together to understand the benefits and risks associated with levees, build awareness among the public, fulfill daily responsibilities on the levee structure, and take actions to manage the future performance of the levee.

b. USACE and levee sponsors have a long history of working together to build and maintain levees and have a responsibility for operation and maintenance for all or a certain portion of a levee system. The USACE Levee Safety Program looks to build on the long history of evaluating and providing engineering solutions for the nation.

c. The purpose of this document is to provide high-level policies for implementing the USACE Levee Safety Program. The policies of the USACE Levee Safety Program primarily apply to federally authorized levees, and do not override individual levee partnership or cooperation agreements. Other USACE programs and authorities may reference or use USACE Levee Safety Program procedures.

d. This chapter describes overarching concepts and reasoning behind the USACE Levee Safety Program and how it interacts with other agencies and programs. All technical terms are defined in the glossary.

1-2. History of the USACE Levee Safety Program.

a. Responsibility for flood risk management and levee systems has evolved over time. Prior to floods in the early 20th century, flood risk management was primarily a local responsibility; many levees were constructed for a variety of purposes and did not benefit from modern engineering practices.

b. After several severe floods, Congress decided there was a federal interest in helping communities reduce the impact of flooding and passed a series of laws authorizing USACE to design, construct, and sometimes maintain levees.

c. Congress also authorized non-federal entities to operate and maintain federally authorized levees. Other laws passed by Congress established the requirement that a written partnership agreement between USACE and levee sponsors identify the "items of local cooperation" for USACE projects, including operation and maintenance requirements necessary to the functioning of the project for its authorized purposes. The specific levee project authorizations, and therefore levee sponsor and USACE roles and responsibilities associated with each levee system, are unique.

d. In 2005, the devastating impacts of Hurricane Katrina underscored the importance of levees and the necessity for using a consistent approach to understand and manage levees. Greater awareness regarding levee systems and their conditions and expected performance was now in the nation's consciousness.

e. In 2007, the National Levee Safety Act directed USACE to maintain an inventory and inspect all federally authorized levees. The National Levee Safety Act, later amended by the Water Resources Reform and Development Act of 2014, also provided congressional direction to implement a National Levee Safety Program by assessing levee condition and potential for loss of life and property damages and sharing that information publicly.

f. The USACE Levee Safety Program is not a regulatory program. It was established to be consistent with Congress's guidelines for levee safety programs, emphasizing working directly with levee sponsors to better understand, prioritize, manage, and build awareness regarding the flood risks associated with levees.

g. The USACE Levee Safety Program was designed to fulfill the following purposes:

(1) Ensure that new and existing levees are managed to continue providing the intended benefits to human lives and property.

(2) Encourage the use of appropriate engineering policies, procedures, and technical practices for levee site investigation, design, construction, operation and maintenance, inspection, assessment, and emergency preparedness.

(3) Build public awareness of the benefits and risks associated with living behind a levee.

(4) Develop technical assistance materials, seminars, and guidelines to improve the reliability of levees in the United States.

1-3. Floodplain Management Activities.

a. Flood risk is managed through a combination of traditional infrastructure (e.g., levee embankments and floodwalls) and non-infrastructure approaches, including local land use planning and ordinances, flood warning systems, and evacuation planning and preparedness. Entities at all levels of government play a role including local communities, states, tribes, and the federal government.

b. USACE and Congress recognize that many levee sponsors do not have the authority or the capacity to perform floodplain management activities such as making land use or zoning decisions. Because of this, integrated approaches to floodplain management will be promoted between all levels of government for those entities that have the authority to do so.

c. This Engineer Circular and the policies of the USACE Levee Safety Program do not add requirements to the levee sponsor that are not part of their project agreement entered into with USACE. All activities discussed in this Engineer Circular will be assigned and planned as appropriate to reflect existing agreements.

d. For any sponsors whose agreements with USACE do not include floodplain management responsibilities, it is still recommended that the sponsors share condition and performance information about their levees with local community leaders and emergency managers to inform their roles.

e. Understanding that responsibilities of sponsors may vary, it may be the role of USACE, in partnership with the sponsor, to work with local community leaders and emergency managers to help them understand the potential impacts of the levee breaching or overtopping.

1-4. Working with Other Federal Programs.

a. Congress directed USACE and the Federal Emergency Management Agency (FEMA) to work more closely together, speak with one voice, share information across agency boundaries, and work toward a solution for the nation's levee safety challenges, utilizing the strengths of both agencies to make the nation stronger. The strength of USACE is in answering and providing solutions for engineering challenges. Some data from the USACE Levee Safety Program can be used by FEMA, for example to support local floodplain management decisions or community requests to accredit levees consistent with the National Flood Insurance Program.

b. Information from the USACE Levee Safety Program can also be used by the USACE Public Law (PL) 84-99 Rehabilitation Program. Many sponsors of federally authorized levees also participate in the PL 84-99 Rehabilitation Program. This document does not set policy for the PL 84-99 Rehabilitation Program, but addresses the areas where information is shared between the programs.

(1) A subset of items evaluated during USACE Levee Safety Program inspections are part of the criteria that determine eligibility for the PL 84-99 Rehabilitation Program.

(2) USACE plans to update the criteria used to determine a levee's continued eligibility in the PL 84-99 Rehabilitation Program. The fact sheet attached in Appendix H summarizes the current understanding of the proposed direction for the changes. The proposed criteria would assess preparedness activities specific to the levee's performance during a flood event. No change will be made to eligibility criteria without going through the federal rulemaking and public input process.

c. Levee Safety Program information may be used by other USACE programs and activities, as well.

(1) For example, if a Section 408 permission request impacts a federally authorized levee, the request will be coordinated through the local USACE district and will be informed by the most updated Levee Safety Program inventory, inspection, and risk assessment information available.

(2) If USACE is conducting a feasibility study of a new levee or floodwall project or studying an existing federal levee system, the planning, design, and engineering teams will consider existing information about that levee system and its past performance generated or maintained by the Levee Safety Program and will conduct a risk assessment on the proposed project.

Chapter 2
USACE Levee Safety Program

2-1. Purpose and Intent.

a. This document establishes the policies for implementing the USACE Levee Safety Program, and describes USACE's activities, roles, and responsibilities for federally authorized levees. This document also describes activities that sponsors are required to conduct or participate in consistent with their project agreements; these responsibilities may vary but typically include operation and maintenance activities.

b. Many project agreements predate today's understanding that effective flood risk management in areas with levees requires recognition that levees can overtop and breach and actions taken by community leaders and emergency managers to raise public awareness about the risk may reduce the consequences of potential flooding.

c. To reduce potential loss of life and property damage behind levees, this document also provides a set of optional practices recommended for levee sponsors – focused on ensuring critical information about the condition of the levee and what is at stake behind it is shared in a meaningful and timely way with others who can reduce and manage risk such as emergency managers, land use managers, elected officials, and those living and working behind levees.

d. The USACE Levee Safety Program includes activities that are intended to help USACE and the levee sponsor work together to fulfill the purposes of the program, organized within the following categories:

(1) Inspections.

(2) Risk assessments.

(3) Levee operation, maintenance, repair, replacement, and rehabilitation (OMRR&R).

(4) Sharing levee information.

(5) Inventory of levees (National Levee Database).

2-2. Applicability: Levees in the USACE Levee Safety Program.

a. This Engineer Circular mainly applies to federally authorized levees, but other USACE programs and authorities may reference or use USACE Levee Safety Program procedures to meet the technical aspects of their program.

b. A levee is a man-made barrier along a watercourse with the principle function of

excluding flood waters from a limited range of flood events from a portion of the floodplain (referred to as "leveed area"). Levee features may consist of embankments, floodwalls, pipes and associated drainage features, closures, pumping stations, floodways, and designed channels.

c. An auxiliary or appurtenant structure for a dam can sometimes be considered a levee. If the structure would likely be necessary without the dam, the structure is managed under the USACE Levee Safety Program. If the structure is needed so the reservoir pool can be used and/or regulated, then the structure is managed under the USACE Dam Safety Program.

d. A levee system is composed of one or more levee segments and other features that are collectively integral to excluding flood water from the leveed area (Figure 2-1). The term "levee segment" is used to identify a discrete portion of a levee system that is operated and maintained by a single levee sponsor.

e. Within this document "levee" and "levee system" are used interchangeably.

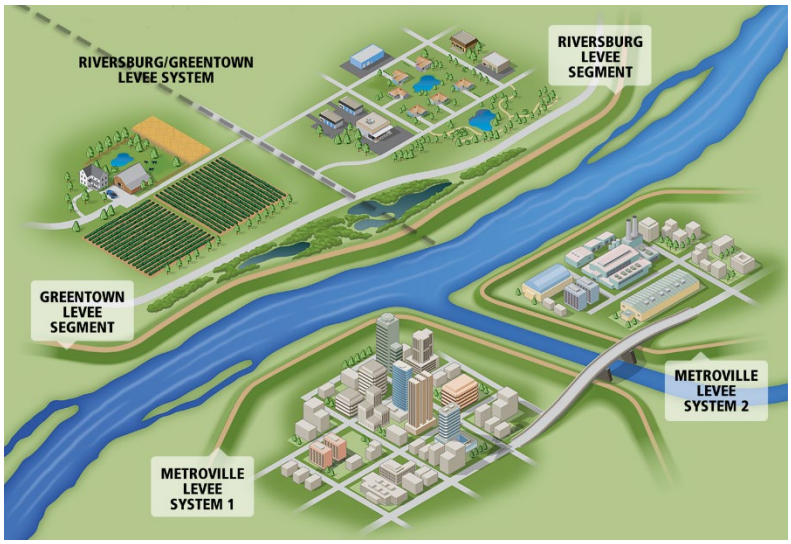

Figure 2-1. Levee systems may be made up of one or more levee segments

f. The USACE Levee Safety Program includes federally authorized levees that are USACE operated or maintained and levees that are federally authorized and locally operated and maintained:

(1) Federally Authorized and USACE Operated or Maintained. These are congressionally authorized levees that USACE has full or partial responsibility to operate or maintain as well as to rehabilitate and modify, as appropriate, under existing authorities.

(2) Federally Authorized and Locally Operated and Maintained. These are levees that are congressionally authorized and operated and maintained by a local public sponsor through a

project agreement with USACE. This category includes levees constructed by USACE and those constructed by others and federally authorized.

g. USACE Levee Safety Program activities may be performed for structures or levees constructed under different authorities:

(1) Non-project Segment. A segment of man-made high ground which a levee system/segment ties into and whose existence and performance is necessary for excluding flood waters from the leveed area. Some examples of these are roadways, railroads, canals, and other levee embankments. Non-project segments are inventoried, inspected, and assessed if they make up part of the levee alignment and are necessary for the proper functioning of the levee system.

(2) Non-federally Authorized and Locally Operated and Maintained, Active in the PL 84-99 Rehabilitation Program.

(a) Levee segments locally constructed, operated, hand maintained, and active within the USACE PL 84-99 Rehabilitation Program are subject to the policies set by the USACE PL 84-99 Rehabilitation Program.

(b) Currently these levees are regularly inspected by USACE using the USACE Levee Safety Program inspection procedures. A subset of 18 inspection items are used to determine eligibility for the USACE PL 84-99 Rehabilitation Program. If these levee segments become ineligible for the USACE PL 84-99 Rehabilitation Program, they are no longer inspected by USACE unless they are connected to a federally authorized levee segment or the sponsor requests an inspection for reevaluation of eligibility.

h. Figure 2-2 shows the general percentage of federally authorized levees that are operated and maintained by USACE or by a local public sponsor (by miles).

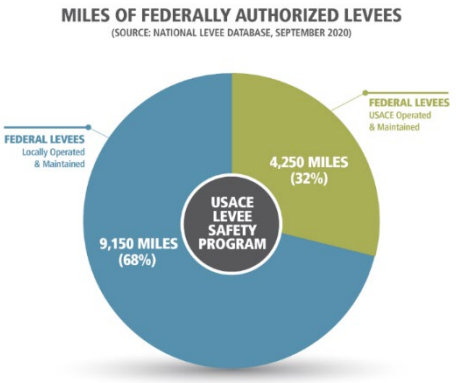

Figure 2-2. Miles of federally authorized levees that are USACE operated and maintained vs. locally operated and maintained

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Chapter 3
Levee Inspections and Site Visits

3-1. Overview.

a. USACE has the authority to inspect all federally authorized levees to ensure that they continue to provide their intended benefits.

b. Levee inspections document the condition of a levee, inform levee management activities, and serve as a primary source of information related to levee condition and performance for risk assessments. Inspections verify any changed conditions and may capture progress of levee management measures for consideration in subsequent inspections or risk assessments. There are two basic types of inspections: formal inspections, which are pre-scheduled, and special inspections, which are unscheduled inspections conducted as needed due to changed conditions or to document performance.

c. A levee site visit is a collaborative activity to observe or verify any changed conditions, provide technical advice and respond to sponsor's questions, or capture progress of levee management measures for consideration in the next inspection or risk assessment. A site visit is not intended to be a detailed inspection nor require extensive documentation and can be conducted at any time. Site visits provide the flexibility to engage with the levee sponsor and conduct a visual observation of the levee system between scheduled inspections.

3-2. Frequency.

a. USACE districts will perform inspections on each federally authorized levee at a minimum of every five years to assess and document the physical condition of the levee system. More frequent USACE inspections may be agreed upon by the USACE district and levee sponsor, as USACE budgets permit, and will be documented within the ten-year outlook in the district's program management plan.

b. In coordination with levee sponsors, USACE districts may choose to perform a special inspection before, during, or immediately after a flood. Inspections occurring during floods are important because they provide data on how the levee is performing with water on it. A special inspection can be conducted in other circumstances such as after earthquakes or major structural modifications to observe and record any changed conditions and verify levee integrity.

c. USACE districts will coordinate with sponsors to determine the frequency of site visits and document it in the ten-year outlook in the district's program management plan.

d. Sponsors will perform their own inspections and provide the results to USACE as required by their project agreements.

3-3. Process.

a. USACE districts will develop a ten-year outlook of inspection and site visit activities for each federally authorized levee as part of the district program management plan. USACE will review this outlook with each levee sponsor to promote efficiency, reduce scheduling conflicts, and promote positive USACE/sponsor relationships.

b. USACE districts will conduct inspections following standardized processes and procedures using the USACE Levee Inspection System. Levee inspections should be performed on a system basis, with all components and segments inspected at or near the same time. Formal and special inspections will be completed using the same processes and procedures.

c. In coordination with the sponsor, USACE districts will customize site visits for each levee which may cover an entire levee segment or may focus on specific sections or features.

d. USACE districts will invite levee sponsors to participate in inspections and site visits. The district will notify levee sponsors of the date of the scheduled inspection or site visit at least 30 business days in advance. For unplanned special inspections, driven by more urgent situations such as flood events, districts will provide as much advance notice to the levee sponsor as possible. The USACE district will give every effort to accommodate the sponsor if the selected dates do not fit a sponsor's availability.

3-4. Results and Approval.

a. USACE districts will compile a report of all findings and provide recommended corrective actions for each levee. The inspection report provides sponsors with information to inform the operation and maintenance of the levee. USACE districts will provide sponsors with a reasonable amount of time to review inspection results to identify if there are any discrepancies or new information that should be considered before finalizing.

b. USACE district Levee Safety Officers will approve inspection results and reports. USACE districts will provide the final inspection report to the levee sponsor within 90 days after the inspection is completed.

c. USACE districts will document site visits in a summary and provide it to the levee sponsor within 30 days after the site visit. If the results of the site visit would result in a change in eligibility status for the PL 84-99 Rehabilitation Program or recommendation for accreditation for the National Flood Insurance Program, the district Levee Safety Program Manager will reach out to the district Emergency Manager, who is responsible for administration of the PL 84-99 Rehabilitation Program, and the appropriate FEMA region.

d. USACE districts will upload all approved inspection and site visit documents to the National Levee Database and notify the USACE district Emergency Manager and FEMA when

new inspection reports are available. Inspection and site visit documents in the National Levee Database will not be publicly viewable but will be available to the levee sponsor.

3-5. Inspection and Site Visit Activities.

a. The required and optional activities for USACE and levee sponsors within each step of an inspection or site visit are outlined in Table 3-1.

b. Specific partnership agreements may require activities listed as "optional" below.

Table 3-1
Inspections and Site Visits: Required and Optional Activities for USACE and Levee Sponsors

	USACE (Required)	**Levee Sponsor (Required)**	**Levee Sponsor (Optional)**
Planning for Inspection or Site Visit	• Coordinate with sponsor to schedule inspection with at least 30 days' notice	• Provide USACE with operation and maintenance records, inspection reports, and any noted changes to the levee	• Work with USACE to find a date for the inspection
Preparing for the Field	• Obtain levee access and required rights of entry	• Ensure USACE access to levee (unlock gates, pump stations, etc.)	• Identify who will represent the sponsor during the inspection
Conducting the Inspection or Site Visit	• Walk entire levee (inspections only) • Lead post-inspection briefing	• Operate gates, closures, pumps, and wells as needed	• Participate during inspection or site visit • Participate in pre-inspection briefing • Participate in post-inspection briefing
Documenting the Inspection or Site Visit	• Compile inspection report or site visit summary • Provide report or summary to the sponsor for review		• Review inspection report or site visit summary and report any inaccuracies or discrepancies to USACE

	USACE (Required)	**Levee Sponsor (Required)**	**Levee Sponsor (Optional)**
Final Documentation	• Upload a copy of the report or site visit summary to the National Levee Database • Provide final copy of the report or summary to the sponsor • Advise FEMA and PL 84-99 Program of inspection report's availability in the National Levee Database	• Maintain a copy of the inspection report or site visit summary in local files	• Share inspection results with community leaders and emergency managers, as needed

Chapter 4
Risk Assessment

4-1. Overview.

a. As authorized by the National Levee Safety Act, USACE will estimate the number of structures and population at risk that would be adversely impacted if the levee breaches or water levels exceed the height of the levee, and measure the probability and severity of undesirable consequences.

b. A risk assessment is a method used across multiple industries to estimate the likelihood and consequences of a particular event. For levees, risk assessments evaluate the hazard and the performance and condition of the levee, which inform the likelihood of levee breach, and the potential life loss and structural or property damages that may result from that breach (Figure 4-1).

Figure 4-1. Components of risk evaluated for levees

c. Levee inspections provide valuable information related to the condition and performance of a levee, but risk assessments provide USACE with an approach to understand the risk unique to each levee system that considers a number of factors such as potential flooding depth, past levee performance, design and construction information, and proximity of population within the leveed area. Understanding and documenting the levee risk can be used to develop a strategy for performing operation, maintenance, repair, replacement, and rehabilitation that is unique to each levee, since no two levees are alike.

d. A risk assessment provides an estimate of the risk, and is a tool that USACE and levee sponsors may use to:

(1) Better understand the most critical areas for a levee system and identify which issues should be prioritized.

(2) Help sponsors make an articulate case for the priority of investments and solutions with elected officials and decision makers.

(3) Highlight key information that should be shared with the broader community impacted by the levee.

e. USACE districts will encourage levee sponsors to participate during risk assessments. Levee sponsors are the most knowledgeable about their levees and provide valuable information regarding condition and past performance.

f. Risk assessments may be performed by any licensed Professional Engineer, but must follow the process outlined in this document; be reviewed by the district Levee Safety Officer, division Levee Safety Program Manager, and the Levee Senior Oversight Group; and have a risk characterization approved by the headquarters Levee Safety Officer.

4-2. Types of Risk Assessments.

a. USACE will perform a screening-level risk assessment on all federally authorized levees.

b. A screening-level risk assessment uses currently available information to inform its findings, considers a suite of standard failure modes, and results in a rough estimate of risk.

c. USACE districts will work with the sponsor, the Levee Senior Oversight Group, and the headquarters Levee Safety Officer or their delegate, to determine whether a more detailed risk assessment would provide more actionable recommendations to the levee sponsor.

d. A more detailed risk assessment is tailored to specific questions of uncertainty in understanding the risk associated with a particular levee and typically involves gathering new information, explores more specific potential failure modes, and can provide more refined numerical probabilities, resulting in a more accurate estimate of risk. The headquarters Levee Safety Officer, or a delegate in their place, will make the final decision to move forward with a more detailed risk assessment while considering available program resources and priorities.

4-3. Frequency.

a. The detailed and data-rich nature of risk assessments require extensive time and resources for both USACE and the sponsor. Because of this and recognizing that most levees do not change significantly within a ten-year period, USACE will conduct risk assessments at a minimum of once every ten years in conjunction with a formal levee inspection for all federally authorized levees.

b. The risk assessment conducted will generally be at the same level as the last risk assessment, which is a screening-level risk assessment. In some cases, a more detailed risk assessment or a more frequent risk assessment may be appropriate for example if the hazard,

levee condition, or characteristics of the leveed area have changed significantly. USACE may also update a risk assessment if there are perceived structural condition changes or if there is an indication that the average life loss or population within the leveed area has increased.

c. For federally authorized levees, levee sponsors or communities may request USACE to perform a risk assessment, or submit a risk assessment following USACE's process, for the purpose of receiving a recommendation for accreditation for the National Flood Insurance Program.

(1) Risk assessments completed by USACE will be conducted consistent with Engineering Construction Bulletin 2019-11, Transition Guidance for Levee System Evaluations for the National Flood Insurance Program.

(2) Consistent with 44 Code of Federal Regulations (CFR) 65.10(e), FEMA may use the information from a USACE risk assessment as part of a levee accreditation decision. In some instances, such as when USACE performs a more detailed risk assessment, USACE will include a National Flood Insurance Program accreditation recommendation if there is enough information to do so.

4-4. Process.

a. USACE will assess the risk for each segment within a levee system. USACE will perform an inspection or site visit in conjunction with all risk assessments to inform understanding of current levee condition and anticipated future performance.

b. The following basic steps will be performed for all levee risk assessments:

(1) Scoping.

(2) Data preparation and hazard identification.

(3) Likelihood assessment.

(4) Consequence assessment.

(5) Computing a risk estimate.

(6) Risk characterization.

(7) Risk assessment review and approval.

c. More details regarding each of the steps can be referenced in Table 4-1 and in the Best Practices for Dam and Levee Safety Risk Analysis (http://www.usbr.gov/ssle/damsafety/Risk/methodology.html).

4-5. Results.

a. USACE and levee sponsors will evaluate all risk assessment information for a levee system and develop a prioritized list of recommendations for levee operation, maintenance, repair, replacement, and rehabilitation, and building risk awareness, based on the associated levee risk. The prioritized list will primarily be based on the results of the risk assessment, which are informed by levee inspections and understanding of the current levee condition and historic performance. USACE will identify actions specific to individual levee segments.

b. USACE, in coordination with the levee sponsor, will develop the risk characterization, a narrative that describes the benefits of the levee system, most critical performance concerns, consequences, and uncertainty. The risk characterization will include as unique subsections descriptions of levee condition and performance, and consequences.

c. USACE districts will provide a summary of all findings and recommended actions for all screening-level risk assessments. The findings will also include a summary of actions that have been completed by the sponsor to effectively operate and maintain the levee. USACE will compile a more comprehensive report for more detailed risk assessments.

d. USACE districts will provide levee sponsors the opportunity to review risk assessment results and other draft products to identify discrepancies or new information that should be considered before providing the risk assessment documentation to the division Levee Safety Program Manager.

e. Levee sponsors may seek reconsideration of the results of a risk assessment by following the process detailed in Appendix D.

f. The Levee Senior Oversight Group will review all risk assessments forwarded by the division Levee Safety Program Manager and make a recommendation for approval of the risk characterization to the USACE headquarters Levee Safety Officer. The USACE district Levee Safety Officer approves the final risk assessment results.

g. USACE districts will provide approved risk assessments to the levee sponsor and upload all risk assessment documents to the National Levee Database within 30 days after results are approved. The district will notify the USACE district Emergency Manager and FEMA when new risk assessment reports are available. Risk assessment documentation in the National Levee Database will not be publicly viewable but will be available to the levee sponsor.

4-6. Risk Assessment Activities.

a. The required and optional activities for USACE and sponsors for risk assessments are outlined below (Table 4-1).

b. Specific partnership agreements may require activities listed as "optional" below.

Table 4-1
Risk Assessments: Required and Optional Activities for USACE and Levee Sponsors

	USACE Districts (Required)	**Levee Sponsor (Required)**	**Levee Sponsor (Optional)**
Scoping	• Coordinate with sponsor to schedule risk assessment with at least 30 days' notice • Determine type and focus of risk assessment • Identify decisions that the assessment will inform and define key questions that the assessment will answer		• Work with USACE district to find suitable dates for the risk assessment • Provide input on key decisions and questions the risk assessment can help answer
Data Preparation and Hazard Identification	• Gather pertinent information such as design and as-built documentation, performance history, river/flood gage data, etc. • Identify the likelihood of flooding, seismic hazards, and security hazards to be considered		• Provide USACE district with any information regarding changes to the levee since the last visit • Provide USACE district with any information regarding previous flooding

	USACE Districts (Required)	Levee Sponsor (Required)	Levee Sponsor (Optional)
Likelihood Assessment	• Estimate the likelihood of breach and overtopping for the most likely scenarios using inspection data, past performance information, and any other information that informs the condition or performance of a levee		• Provide USACE district with any information regarding past performance of the levee
Consequence Assessment	• Estimate potential loss of life, economic losses, and environmental impacts		• Provide USACE with best available information regarding the population and property behind the levee • Provide relevant points-of-contact to USACE to discuss community evacuation effectiveness and flood awareness • Participate in discussions between USACE and other community members
Computing a Risk Estimate	• Calculate the combination of the likelihood of flooding (due to levee breach) within the leveed area and the associated		

	USACE Districts (Required)	Levee Sponsor (Required)	Levee Sponsor (Optional)
	potential for life loss and property damages and plot the results		
Risk Characterization	• Work with the levee sponsor to draft a narrative that describes the benefits of the levee system, most critical performance concerns, consequences, and uncertainty • Work with sponsor to draft a prioritized list of recommendations		• Work with USACE to draft a narrative that describes the benefits of the levee system, most critical performance concerns, consequences, and uncertainty • Work with USACE to draft a prioritized list of recommendations
Review and Approval	• Provide risk assessment report to levee sponsor for review • Invite sponsor to participate in Levee Senior Oversight Group meeting • Provide risk assessment results to FEMA and PL 84-99 Program • Upload final documentation to National Levee Database after levee sponsor review (report not publicly available)		• Participate in Levee Senior Oversight Group meeting • Review risk assessment results and report any inaccuracies or discrepancies to USACE district • Maintain a copy of the risk assessment results in local files

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Chapter 5
Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R)

5-1. Overview.

a. Levees reduce the probability of flooding within a leveed area. However, continued successful performance of the project will depend on the manner in which levee sponsors operate, maintain, and rehabilitate the project. Proper maintenance, establishment of effective operational procedures, and repair, replacement or rehabilitation of the levee structure can prevent serious flood damages that could result from breach of any part of the levee.

b. Levee operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) enable the sponsor to fulfill their daily responsibilities and take action to reduce risk. Successful levee OMRR&R should be informed by inspection and risk assessment results to maximize benefits with limited resources.

c. Levee operation, maintenance, and repair are routinely performed activities to help sponsors and USACE fulfill daily responsibilities, whereas activities related to replacement and rehabilitation are non-routine and typically require increased time and resources.

5-2. Operation, Maintenance, and Repair Activities.

a. Sponsors of federally authorized levees have been provided an operation and maintenance (O&M) manual, or OMRR&R manual, that contains relevant documentation and reports, maps, drawings, references, and procedures pertinent to the operation and maintenance of their levees. Levee sponsors will operate and maintain their levee, which can include performing regular inspections and testing and monitoring instruments and equipment among other activities, consistent with the O&M manual.

b. The required and optional activities for USACE and sponsors within operation and maintenance are outlined below (Table 5-1).

c. Specific partnership agreements and O&M manuals may require activities listed as “optional” below.

Table 5-1
Operation and Maintenance: Required and Optional Activities for USACE and Levee Sponsors

	USACE Districts (Required)	**Levee Sponsor (Required)**	**Levee Sponsor (Optional)**
Operation	• Provide technical assistance to sponsors, if requested and authorized • Operate federally operated and maintained levees consistent with the O&M manual or USACE guidance	• Operate levees consistent with the O&M manual	• Request technical assistance from USACE district, if needed
Maintenance and Repairs	• Provide technical assistance to sponsors, if requested • Review prioritized list of operation, maintenance, and repair recommendations with sponsor • Work with sponsor to track progress of recommendations and re-prioritize list as needed • Perform routine maintenance and repairs for federally operated and maintained levees consistent with the O&M manual or USACE guidance • Upload maintenance records to National Levee Database	• Perform routine maintenance and repairs on levees consistent with the O&M manual • Provide maintenance and repair records to USACE district	• Request technical assistance from USACE district, if needed • Review prioritized list of recommendations based on the latest risk assessment and inspection with USACE

	USACE Districts (Required)	Levee Sponsor (Required)	Levee Sponsor (Optional)
Sponsor Inspections	• Upload inspection results and reports submitted from sponsor to the National Levee Database (not publicly viewable)	• Perform inspection consistent with the O&M manual • Provide inspection results to USACE district	

5-3. Replacement and Rehabilitation Activities.

a. USACE districts will use the most updated inspection and risk assessment to inform recommendations for replacement or rehabilitation of a levee and will track and monitor the progress of recommendations for each levee.

b. Levee sponsors are only required to execute replacement or rehabilitation activities as directed within their individual project agreements with USACE. USACE districts will be available for technical assistance to sponsors completing levee replacement or rehabilitation.

c. USACE will work with levee sponsors to identify, monitor, track, and adapt activities and actions for a levee system. USACE will monitor progress on recommendations for the levee system, and for individual segments.

d. The required and optional activities for USACE and sponsors within replacement and rehabilitation are outlined below (Table 5-2). Specific partnership agreements may require activities listed as “optional” below.

Table 5-2
Replacement and Rehabilitation: Required and Optional Activities for USACE and Levee Sponsors

	USACE Districts (Required)	**Levee Sponsor (Required)**	**Levee Sponsor (Optional)**
Prioritize Replacement and Rehabilitation Activities	• Develop prioritized list of recommendations based on the latest inspection and risk assessment results with sponsor		• Develop prioritized list of recommendations based on the latest inspection and risk assessment results with USACE • Work with others in the community to prioritize recommendations
Complete Replacement and Rehabilitation Activities	• Provide technical assistance to sponsors, if requested and authorized • Perform replacement or rehabilitation in order of priority for federally operated and maintained levees	• Complete structural repair, replacement, or rehabilitation (only required for sponsors with the requirement within a project agreement) • Provide records to USACE district	
Track Replacement and Rehabilitation Activities	• Work with sponsor to track progress of replacement and rehabilitation and re-prioritize list of recommendations as needed		• Work with USACE to track progress of replacement and rehabilitation and re-prioritize list of recommendations as needed

Chapter 6
Sharing Levee Information

6-1. Overview.

a. During inspections and risk assessments, USACE and the sponsor learn information about a levee and can use that information to make decisions about what actions should be taken to manage that levee. Because communities can be impacted by the flood hazard, levee performance and condition, and potential consequences of levee failure, information should be shared with community leaders and emergency managers.

b. The goal for levee sponsors is to communicate levee condition and performance information to those who may need it, such as local emergency management agencies with responsibility for community evacuation, or local agencies responsible for land-use planning in the community.

c. In some cases, levee sponsors may communicate consequence information as well, but because not all levee sponsors have the authority or responsibility to communicate consequence information, USACE may be responsible for communicating that information. To accomplish this, USACE will make some information publicly available in the National Levee Database. USACE may also communicate directly with community leaders and decision makers, as needed.

d. Sharing levee information helps raise awareness about:

(1) Why the levee is there and the benefits it provides.

(2) Potential performance issues associated with the levee.

(3) Actions taken before, during, and after a flood event.

(4) Actions being taken to preserve levee related benefits.

e. This information is helpful to others who have the authority and responsibility in the area behind the levee, such as community leaders and emergency managers.

6-2. Shared Levee Information Between USACE and Sponsors.

a. USACE districts will review inspection and risk assessment results with levee sponsors to establish a common understanding of the levee risk, any changed conditions, and recommendations.

b. As part of this activity, districts will discuss the following with the sponsor:

(1) Key components of risk, including likelihood and nature of flood threat (hazard), physical condition of the levee and likelihood of breach (performance), and the nature and severity of consequences should the levee breach or be overtopped.

(2) Any areas of uncertainty and the relevance of that uncertainty.

(3) Information about levee segments and how each segment contributes to the overall risk.

(4) Priority and sequencing of recommended risk management activities.

(5) Information that should be shared with others in the area behind the levee and whether USACE or the sponsor will take the lead to share this information.

6-3. Sharing Levee Information with Decision Makers in the Area Behind the Levee.

a. USACE and levee sponsors will work together to develop a strategy to share levee information with those who may need it to make a decision, such as local emergency agencies with responsibility for community evacuation, or local agencies responsible for land-use planning in the community.

b. Levee sponsors are only required to share levee information, such as the levee condition and performance and potential impacts to the leveed area, with others as directed within their individual project agreements. When agreements do not specify this, USACE districts will fulfill these responsibilities, unless the sponsor chooses to do so.

c. USACE districts can provide technical assistance to sponsors sharing levee information. USACE districts can assist and serve as the technical expert to explain levee-related risk to the public or other interested parties. Districts can also assist levee sponsors in developing publicly consumable information or other visual tools.

d. USACE may also communicate directly with community leaders, decision makers, and members of the public as needed. When doing so, USACE will coordinate with levee sponsor as well as other key partners.

6-4. The Levee System Summary.

a. Each district will work with levee sponsors to develop a levee system summary which will serve as a comprehensive source of publicly available information in the National Levee Database.

b. The main content of the levee system summary will include:

(1) Background information on the levee system.

(2) A characterization of the current levee condition and anticipated performance.

(3) A description of potential loss of life and property damages and a discussion regarding who is responsible for managing the potential losses.

(4) Recommended areas of focus for the levee sponsor.

(5) National Flood Insurance Program status.

(6) USACE PL 84-99 Rehabilitation Program status.

6-5. Levee Information Sharing Activities.

a. The required and optional activities for USACE and sponsors within sharing levee information are outlined below (Table 6-1).

b. Specific partnership agreements may require activities listed as "optional" below.

Table 6-1
Sharing Levee Information: Required and Optional Activities for USACE and Levee Sponsors

	USACE (Required)	**Levee Sponsor (Required)**	**Levee Sponsor (Optional)**
Planning	• Develop information sharing strategy and incorporate it into district program management plan		• Work with the district to develop a strategy to share levee condition and performance information
Sharing Information Between USACE and Sponsor	• Review inspection, site visit, and risk assessment results with sponsor • Work with sponsor to develop and maintain the levee system summary • Upload the levee system summary to the National Levee Database (publicly viewable)		• Review inspection, site visit, and risk assessment results with USACE district • Work with USACE district to develop and maintain the levee system summary • Review levee system summary and provide

	USACE (Required)	Levee Sponsor (Required)	Levee Sponsor (Optional)
			feedback to USACE district • Share any information regarding major changes to the levee with USACE district
Sharing Information with Others	• Work with sponsors to identify audiences with whom to share levee information • Identify audiences with whom to share levee information (for federally operated and maintained levees) • Work with sponsors to determine optimal delivery of information to the audience(s) (newsletter, town hall meeting, social media, etc.) • Share levee information with those who have that authority to manage the hazard and consequences, if deemed necessary (for sponsors without a requirement within their project agreement)	• Share levee condition and performance information with those who have authority to manage the hazard and consequences (only required for sponsors with the requirement within their project agreement)	• Work with USACE district to identify audiences with whom to share levee information • Work with USACE district to determine optimal delivery of information to the audience (newsletter, town hall meeting, social media, etc.) • Share levee information with those who have authority to manage the hazard and consequences (for sponsors without a requirement within their project agreement)

Chapter 7
Inventory of Levees

7-1. Overview.

a. The National Levee Safety Act requires USACE to create an inventory of levees that is publicly available to promote public awareness of the benefits and risks associated with living behind a levee.

b. The inventory includes the levee's location, general condition information, and an estimate of the number of structures and population within the leveed area. A comprehensive inventory of the nation's levees serves as a key resource for USACE and sponsors to share information related to their levees.

7-2. National Levee Database.

a. USACE districts will maintain a publicly available inventory of levees using the National Levee Database. All federally authorized levees will be included in the National Levee Database.

b. Data types. USACE districts will maintain the following main data within the National Levee Database:

(1) Levee location information (including geographical information system data).

(2) Specific physical levee attributes and features.

(3) An estimate of the number of structures and population at risk and protected by each levee that would be adversely impacted if the levee fails or water levels exceed the height of the levee.

(4) Design and construction documents.

(5) Inspection and risk assessment information.

(6) Levee accreditation status in the National Flood Insurance Program (provided by FEMA).

c. Maintaining data.

(1) The district Levee Safety Program Manager is responsible for maintaining the National Levee Database data for federally authorized levees in their area of responsibility. The district will coordinate updates to levee data with the project sponsor to ensure data quality and freshness.

(2) FEMA will maintain National Levee Database data related to the National Flood Insurance Program.

d. Availability of information.

(1) All information fields within the National Levee Database will be viewable to USACE and other federal agency employees. Levee sponsors will be provided full access to all information fields for the levees for which they are responsible. State, regional, tribal, and local governmental employees will be provided access to information fields for their areas of responsibility relevant to their role or authority.

(2) Many of the information fields within the National Levee Database are viewable by the public. Fields that may pose risk to the security of the levee infrastructure are protected by password/account security and only available to authorized users.

e. Process. The general process for maintaining the National Levee Database levee inventory includes obtaining levee data, providing and obtaining database access, uploading data, ensuring data quality, and updating data.

7-3. Inventory of Levees Activities. The required and optional activities for USACE and sponsors within each step of inventory are outlined below (Table 7-1).

Table 7-1
Inventory of Levees: Required and Optional Activities for USACE and Levee Sponsors

	USACE (Required)	**Levee Sponsor (Required)**	**Levee Sponsor (Optional)**
Obtaining/ Updating Data	• Locate or request best available data from sponsor		• Provide best available data related to their levee to USACE (generally through inspections)
Accessing Database	• Provide sponsors with credentials to access database		• Request database access from USACE
Uploading Data	• Upload data to database		
Ensuring Data Quality	• Perform quality assurance on uploaded data		• Review data for accuracy • Provide corrected data to USACE when errors are detected

Chapter 8
USACE Levee Safety Program Personnel and Program Management

8-1. Overview.

a. The USACE Levee Safety Program will be implemented using a coordinated team comprised of staff from the headquarters, division, and district levels. Levee safety personnel at each level of the organization enables efficient coordination and collaboration between districts, divisions, and headquarters, and provides levee sponsors with individual points-of-contact at each level. USACE responsibilities described in this document can be delegated unless otherwise noted.

b. USACE Levee Safety Program management will also provide processes and a structure for planning, managing, and monitoring program implementation. Program management will provide a consistent approach for levee safety personnel to implement the activities part of this program in partnership with local levee sponsors.

8-2. Levee Safety Program Personnel.

a. USACE Levee Safety Program personnel consists of individuals with experience in levee safety with whom sponsors may consistently coordinate and engage. A Levee Safety Officer and Levee Safety Program Manager at the district, division, and headquarters level will provide a consistent point of contact for sponsors.

b. The Levee Safety Officer will lead levee safety issues, recommendations, and decisions at each level in the organization. The position of the Levee Safety Officer will be filled by an existing, qualified civil engineer within USACE. The Levee Safety Officer is typically the Chief of Engineering and Construction and must be a registered Professional Engineer.

c. The Levee Safety Program Manager will lead coordination and implementation of the Levee Safety Program at each level in the organization. The position of the Levee Safety Program Manager will be filled by an existing, qualified engineer or geologist within USACE. The Levee Safety Program Manager must be a registered Professional Engineer or Geologist.

8-3. Levee Senior Oversight Group.

a. The Levee Senior Oversight Group is comprised of a multi-disciplinary team of existing levee safety professionals from across USACE to provide consistent program oversight.

b. The Levee Senior Oversight Group has a high level of expertise and a comprehensive knowledge of levees across the country and will review risk assessment results and provide recommendations to the USACE headquarters Levee Safety Officer and the field regarding levee safety and risk procedures, methods, and results. The members of the Levee Safety Oversight group are designated by the USACE Levee Safety Officer.

8-4. Levee Safety Program Management Plan.

a. The Levee Safety Program Manager at each level will create and maintain a program management plan. The program management plan will be reviewed and updated on an annual basis. A program management plan is a formal, approved, living document used to define program requirements and expectations, accountability and performance measurements, and guide program execution. The document will note delegation of program responsibilities when applicable.

b. District program management plans will include a ten-year outlook that is coordinated and reviewed annually with each levee sponsor in the district's area of responsibility to outline a tentative schedule of inspections, site visits, and risk assessments that will involve both USACE and the sponsor.

c. As part of each district program management plan, districts will develop and maintain a district-level strategy (coordinated with both levee sponsors and FEMA) for sharing levee information corresponding with Levee Safety Program activities.

8-5. Program Monitoring.

a. The headquarters Levee Safety Program Manager will monitor the progress of the Levee Safety Program through program metrics, rotating program audits, and periodic external review of the program.

b. Program metrics. The headquarters Levee Safety Program Manager will establish specific program metrics to measure USACE's progress in meeting program objectives. The headquarters Levee Safety Program Manager will document metrics in the headquarters program management plan and will review and update metrics as needed. District and division commanders will be required to report progress on metrics.

c. Rotating program audits. The headquarters Levee Safety Program Manager will conduct an annual audit on two divisions to review each of their districts' implementation of the Levee Safety Program. The audit will analyze compliance with policy, the ability to meet program metrics, engagement with levee sponsors and FEMA, internal coordination with other USACE programs, and quality of levee safety program products and decisions. The process for conducting these audits will be detailed in the headquarters program management plan.

d. Independent review. At a minimum of every five years, the headquarters Levee Safety Program Manager will initiate an independent review of the Levee Safety Program, which will include a review of policies, procedures, and performance. USACE headquarters will use the results from the review to adapt and improve program implementation.

8-6. Program Recognition and Awards.

a. Headquarters awards.

(1) Each year, USACE will recognize a levee safety team and individual for exemplary contributions to the Levee Safety Program.

(2) The USACE Levee Safety Program may also recognize outstanding levee sponsors that have been nominated by the districts and divisions.

b. District and division awards.

(1) Each year, USACE districts and divisions are encouraged to recognize USACE levee safety professionals for their contributions to the levee safety community of practice and levee sponsors for outstanding operation and maintenance of their projects.

(2) USACE districts and divisions are also encouraged to provide awards to those non-federal sponsors that have effectively met their commitments in the condition and performance of their levees. The selection of nominees for these awards should be informed by those things for which the sponsors have a responsibility, which typically would include condition and performance activities.

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Appendix A
References

The following references provide additional context and direction for implementing the U.S. Army Corps of Engineers Levee Safety Program.

United States Code (USC). 33 USC Chapter 46: Title 33 -- Navigation and Navigable Waters; Chapter 46 – National Levee Safety Program. https://uscode.house.gov/view.xhtml?path=/prelim@title33/chapter46&edition=prelim.

United States Code. 33 USC 701n: Title 33 -- Navigation and Navigable Waters; Chapter 15 – Flood Control; §701n – Emergency response to natural disaster. https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title33-section701n&num=0&edition=prelim.

United States Code. 42 USC 1962d-5b: Title 42 – The Public Health and Welfare; Chapter 19B – Water Resources Planning; Subchapter IV – Miscellaneous Provisions; §1962d-5b – Written agreement requirement for water resources projects. https://uscode.house.gov/view.xhtml?path=/prelim@title42/chapter19B&edition=prelim.

United States Code. 33 USC §408: Title 33 -- Navigation and Navigable Waters; Chapter 9 – Protection of Navigable Waters and of Harbor and River Improvements Generally; §408 - Taking possession of, use of, or injury to harbor or river improvements. https://uscode.house.gov/view.xhtml?path=/prelim@title33/chapter9&edition=prelim.

United States Code of Federal Regulations. 33 CFR § 208.10: Title 33 - Navigation and Navigable Waters; Chapter II - Corps of Engineers, Department of the Army (Parts 203-208); Part 208 - Flood Control Regulations; Section 208.10 - Local flood protection works; maintenance and operation of structures and facilities. (July 1, 2011 edition). https://www.govinfo.gov/app/details/CFR-2011-title33-vol3/CFR-2011-title33-vol3-sec208-10.

ER 10-1-54, Roles and Responsibilities – Modeling, Mapping, and Consequences Production Center. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_10-1-54.pdf.

ER 10-1-55, Roles and Responsibilities – Risk Management Center. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_10-1-55.pdf?ver=2013-09-09-124951-653.

ER 500-1-1, Civil Emergency Management Program. https://www.publications.usace.army.mil/portals/76/publications/engineerregulations/er_500-1-1.pdf.

ER 1105-2-101, Risk Assessment for Flood Risk Management Studies. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1105-2-101.pdf.

ER 1110-2-401, Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual for Projects and Separable Elements Managed by Project Sponsors. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-401.pdf.

ER 1110-2-1156, Safety of Dams – Policy and Procedures. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1156.pdf.

ER 1130-2-530, Flood Control Operations and Maintenance Policies. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/er_1130-2-530.pdf.

ER 1165-2-26, Implementation of Executive Order 11988 on Flood Plain Management. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1165-2-26.pdf.

ER 1165-2-217, Review Policy for Civil Works. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerCirculars/EC_1165-2-217.pdf?ver=2018-05-01-105219-217.

EP 1105-1-1, Sponsor's Guide to the USACE Levee Safety Program. https://www.publications.usace.army.mil/Portals/76/Users/227/19/2019/EP_1105-1-1.pdf?ver=5Obrpu3dnO0vHEtu7mfUEw%3d%3d.

EP 1110-2-17, A Guide to Public Alerts and Warning for Dam and Levee Emergencies. https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/EP%201110-2-17.pdf?ver=2019-06-20-152050-550.

EP 1110-2-18, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures. https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/EP_1110-2-18.pdf?ver=bVt-L-DvQrASeFS6szPNaw%3d%3d.

EM 1110-2-1413, Hydrologic Analysis of Interior Areas. https://www.publications.usace.army.mil/Portals/76/Users/227/19/2019/EM_1110-2-1413.pdf?ver=vXkP1EpOfhBDNqKoYxfSMw%3d%3d.

EM 1110-2-1908, Instrumentation of Embankment Dams and Levees. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-1908.pdf.

EM 1110-2-1913, Design and Construction of Levees. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-1913.pdf.

EM 1110-2-2502, Design of Retaining and Flood Walls. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-2502.pdf.

EM 1110-2-2504, Design of Sheet Pile Walls. https://www.publications.usace.army.mil/portals/76/publications/engineermanuals/em_1110-2-2504.pdf.

EM 1110-2-2902, Conduits, Pipes, and Culverts Associated with Dams and Levee Systems. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-2902.pdf.

ETL 1110-2-588, Geotechnical System Response Curves for Risk Assessments. https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/ETL%201110-2-588.pdf?ver=5CFy-Cn3XRXndvuOmdhG0A%3d%3d.

EC 1110-2-6075, Inundation Maps and Emergency Action Plans and Incident Management for Dams and Levee Systems. https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/EC%201110-2-6075.pdf?ver=N6pf63wzqYGbRM_XgvRkgw%3d%3d.

EC 1165-2-220, Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408. https://www.publications.usace.army.mil/Portals/76/Users/227/19/2019/EC_1165-2-220.pdf?ver=2018-09-13-114714-120.

ECB, 2019-11, Transition Guidance For Levee System Evaluations For The National Flood Insurance Program (NFIP). https://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb/usace-ecb-2019-11.

ECB, 2019-15, Interim Approach for Risk-Informed Designs for Dam and Levee Projects. https://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb/usace-ecb-2019-15.

ECB, 2019-8, Managed Overtopping of Levee Systems.
https://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb/usace-ecb-2019-8.

ECB 2019-3, Risk Informed Decision Making for Engineering Work During Planning Studies.
https://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb/usace-ecb-2019-3.

Best Practices in Dam and Levee Risk Analysis.
http://www.usbr.gov/ssle/damsafety/Risk/methodology.html

National Levee Database. http://levees.sec.usace.army.mil.

USACE Levee Safety Program. https://www.usace.army.mil/Missions/Civil-Works/Levee-Safety-Program/.

Appendix B
The U.S. Army Corps of Engineers Levee Safety Program

B-1. Purpose. The purpose of this appendix is to provide an overview of the U.S. Army Corps of Engineers' (USACE) Levee Safety Program and its role relevant to USACE's authorized responsibilities for levees.

B-2. A Coordinating Framework for USACE's Responsibilities Related to Levees.

a. USACE's authorized responsibilities related to levees are broad. These responsibilities include:

(1) Planning, designing, and constructing and modifying levees when authorized by Congress.

(2) Assessing the condition of existing federally authorized levees with levee sponsors.

(3) Providing recommendations and technical support when requested.

(4) Assessing the benefits to people or property due to a well performing levee system.

(5) Sharing information and tools with other programs, agencies, communities, and the public.

(6) Conducting emergency activities to supplement local efforts when requested.

(7) Rehabilitating eligible levees damaged by flooding.

(8) Performing operation and/or maintenance activities on specific levees as authorized.

b. These responsibilities are implemented with and through a variety of USACE programs such as planning, engineering and construction, emergency management, operations, regulatory, and technical services.

c. USACE created the Levee Safety Program to serve as an organizing framework and improve consistency and coordination in how levee-related activities are implemented across the organization. The Levee Safety Program provides tools and resources intended to improve the alignment and effectiveness of decisions made across USACE and in collaboration with levee sponsors.

d. Specifically, the USACE Levee Safety Program provides:

(1) Inspections, engineering analyses, and solutions intended to support decision making

within the organization and external to the organization (levee sponsors, communities, other state and federal agencies, etc.).

(2) Consistent procedures for evaluating and making decisions for levees.

(3) Information to help others understand, prioritize, manage, and build awareness regarding the benefits and flood risks associated with levees.

e. Information gathered through the USACE Levee Safety Program directly informs actions within other USACE programs such as emergency related assistance and repairs. USACE has the authority to provide disaster preparedness, operations, rehabilitation, and advance measures assistance. The USACE emergency management community of practice leads these efforts but relies on information from the Levee Safety Program when levees are involved to inform how flood preparedness, fighting, and repairs occur. For example, items of concern identified during a recently completed USACE inspection or risk assessment can inform where to locate temporary measures, implement increased monitoring, and preparedness activities for flooding flighting.

f. USACE administers the voluntary Public Law (PL) 84-99 Rehabilitation Program, which provides for repair of eligible flood risk management projects and constructed coastal risk management projects damaged by natural disasters. The criteria for a levee to be eligible for the PL 84-99 Rehabilitation Program is informed by items evaluated during a levee inspection. Consistent with the interim guidance issued in 2014 (Interim Policy for Determining Eligibility Status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to PL 84-99), USACE determines eligibility for the PL 84-99 Rehabilitation Program using a subset of inspection items (18 specified items) in the existing USACE levee inspection checklist.

g. Levee Safety Program tools can also be applied in support of Section 408 decisions. Section 408 (33 U.S. Code 408) provides a mechanism to alter an existing USACE civil works project without seeking congressional authorization as long as the project continues to deliver its intended benefits. USACE can use the Levee Safety Program's risk assessment methodology to get a better understanding of how a proposed alteration might impact the performance of the levee and whether the benefits of the alteration outweigh any concern of new or worsened areas of stress on the levee.

h. Levee Safety Program tools and methodologies are used to inform USACE civil works projects in the planning, design, and construction phases. For example, when USACE is completing a planning study and considering an alternative that includes a levee or floodwall, the planning team will use the methodology and steps associated with a risk assessment to understand the benefits of varying designs of the levee system. This analysis helps the planning team understand how much flood risk is reduced by the proposed levee. Information from previously completed risk assessments and inspections can also be used to inform a study being completed on an existing levee.

i. The tools developed and information gathered by the USACE Levee Safety Program are used by the Federal Emergency Management Agency (FEMA). For example, FEMA and USACE continue to collaborate to develop a shared set of levee data to use in support of separate and shared mission activities. Doing so can increase efficiencies among the agencies, but also help FEMA and USACE provide consistent information to those who operate and maintain or benefit from a levee. As an example, information gathered by USACE during risk assessments and levee inspections can be used by a community to meet a sub-set of criteria required for accreditation in the National Flood Insurance Program, administered by FEMA.

j. The Levee Safety Program continues to improve the use of tools, data, and methodologies to support levee-related decisions not only of USACE but of other federal, state, tribal, and local entities including those responsible for or benefitting from levees. Using shared approaches and information for levee-related decisions supports consistent actions for new and existing levees intended to reduce the risk of flooding to communities and the things they value.

B-3. Levees and Flood Risk Management.

a. Levees are an essential tool communities and businesses rely on to keep floodwaters away from the things they value. Typically, levees are designed to a size and shape to withstand certain flood events and are often built next to or aligned with one another to keep floodwaters out of a certain area. Sometimes multiple levee systems are designed to work together in a larger watershed approach.

b. Multiple levees keeping water away from a shared area are often viewed as a system as they work together to reduce the risk of flooding to people and property. Sometimes these levees are considered a system simply due to the way they function, but some levees are also congressionally authorized to be operated and maintained that way.

c. Levee systems can be comprised of individual levees, or levee segments, often operated and maintained by a single entity. The authorities and responsibilities of sponsors of individual levee segments vary and are unique to the agreements made when the project was first authorized and constructed.

d. USACE and levee sponsors work together to ensure federally authorized levees continue to provide their intended benefits to communities. Doing so requires a close understanding of levees, including individual segments as well as the systems they comprise. A weak or low point in any part of a levee system can impact the levees' continued ability to keep water away from the leveed area.

e. USACE is responsible for understanding how individual levees work together, and how those levees can impact a community's need to adopt additional measures to further protect things of value – including people, property, environment, agriculture, cultural resources, navigation, etc.

f. The Levee Safety Program is designed to answer questions related to individual levees but often combines understanding of how all levees work together as a system. For example, USACE will look at each levee segment and high ground that those segments tie into, i.e. a railroad, roadway, or another embankment often referred to as non-project segments, as part of inspections and risk assessments to understand how each piece influences performance of the system as a whole. Doing so also helps USACE evaluate how the levee system will function within the broader floodplain, which can include neighboring levees, upstream dams, and other structures that influence the situations in which the levee may see water.

g. Focusing Levee Safety Program activities at the system level helps prioritize recommendations, resources, and activities for levees on the areas of greatest concern and where the most impact can be made to ensure the levees continue to provide their intended benefits.

h. While USACE will recommend activities and actions that consider how the levee functions within the broader floodplain, levee sponsors are not expected or required to take actions that are not within their authorities and responsibilities. Recommendations that extend beyond the footprint of the levee are often most applicable to decision makers in the area behind the levee such as emergency managers, floodplain managers, or hazard mitigation officers.

i. Communicating findings and information from Levee Safety Program activities about the condition and performance of individual levee segments and systems is important for bolstering understanding of the levee, the importance of continued investment, and spurring other actions within the community itself. USACE and levee sponsors will work together to develop a shared understanding of levee information from inspections and risk assessments, and an approach to communicate this information with others who may need it.

j. USACE works with levee sponsors to ensure results and information from key program activities are communicated so they are relevant and actionable for each levee segment. USACE provides each levee sponsor their individual levee segment results so they know what specific information relates to their areas of responsibility, as well as the information that shows how their levee segment relates to the entire levee system.

k. In cases where a finding or recommendation relates to the levees system, USACE will work with the sponsor or entity responsible for each levee segment to support understanding of and actions to address areas of concern that most impact future levee performance.

l. The following table (Table B-1) summarizes Levee Safety Program activities and products and how they are used to characterize or communicate levee information by segment or by system.

Table B-1
Levee Safety Program Activities and Products

Activity	Primary Use	System or Segment Focus
Inspections	• Document the condition of the levee	• Performed on individual levee segments • When a segment is part of a levee system, USACE will work to inspect all segments at the same time • Results and ratings of specific items are summarized at the segment level in an inspection report • Results are shared with the entity responsible for the segment
Site visits	• An optional collaborative activity to observe or verify changed conditions or provide technical advice	• Performed on individual levee segments or unique site locations • Summarized in a site visit summary • Shared with the entity responsible for the segment
Screening risk assessments	• Characterize the following: likely hazards a levee may face, anticipated performance of the levee based on its condition and how it has performed in the past, who and what is behind and benefiting from the levee, and potential impacts to people and property behind the levee • Uses existing best available information and focuses on a standard set of questions	• Performed on individual levee segments • When a segment is part of a levee system, USACE will complete screenings for all segments of the system collectively • Recommendations may relate to individual segments • Results are reported at the system level in a summary report • The estimated risk for the levee system is based on the highest risk segment

Activity	Primary Use	System or Segment Focus
Higher level risk assessments (semi-quantitative and quantitative)	• Characterize the following: likely hazards a levee may face, anticipated performance of the levee based on its condition and how it has performed in the past, who and what is behind and benefiting from the levee, and potential impacts to people and property behind the levee • Includes gathering new information and focusing on a customized set of questions	• Performed at the system level • Results will include findings and recommendations relevant to individual levee segments
Levee risk management summary	• Internal tool for USACE and levee sponsors that documents best available levee information • Includes recommended actions for levee sponsors as well as actions that others can take	• Summarizes best available levee information at the system level • Includes recommendations applicable to individual levee segments
Levee system summary	• Public summary of best available levee information • Serves as the basis for tailoring subsequent communication materials	• Summarizes best available levee information for the public at the system level • Can be developed for individual segments that comprise a system
National Levee Database	• Publicly available inventory of levees in the United States	• Includes information for individual levee segments and for the system

m. Levees are one piece of overall flood risk management. The Levee Safety Program will continue to work with levee sponsors to understand and communicate with those in the leveed area the condition and performance of levees, the benefits they provide, and the important role they play reducing flood damages, and with others who make levee-related decisions to ensure those decisions are made using best available, shared information on levees.

Appendix C
Levee Inspections and Site Visits

C-1. Purpose. The purpose of this appendix is to provide an overview of the responsibilities and procedures for levee inspections and site visits conducted by the U.S. Army Corps of Engineers (USACE).

C-2. Why Inspect Levees.

a. Levees change over time – their slopes can crack, animals can burrow into them, or embankments can settle. Any of these or other changes to the condition of the levee can impact how it responds during a flood.

b. Inspections are a key tool that help those responsible for levees keep watch over them, identify areas of concern, and take action to address them. USACE and levee sponsors regularly inspect levees, including before, during, and after flooding, to understand their condition, performance, and any needed actions. Doing so can help inform daily and regular activities and maintenance on the levee to keep it in good condition and ready for any future floods.

C-3. Planning in Advance.

a. USACE will inspect federally authorized levees at least once every five years. These inspections, referred to as formal inspections, are planned for and scheduled in advance in collaboration with levee sponsors.

b. Special inspections and site visits are additional tools USACE and levee sponsors can use to document the condition of a levee in between planned formal inspections. Both give USACE and levee sponsors flexibility to adjust activities on the levee based on more current information.

c. While special inspections follow the same procedures as a formal inspection, they are done as needed in between formal inspections to understand any changes in levee conditions or to document performance during a flood event. USACE may also perform site visits between formal inspections. A site visit can be conducted at any time to verify the levee condition or track progress of any actions on the levee. Site visits are not intended to be as detailed as a formal or special inspection nor require extensive documentation.

d. District Levee Safety Program Managers are responsible for working with levee sponsors to plan for and schedule levee inspections and site visits as part of their program management plan, which will include a ten-year outlook of Levee Safety Program activities. District Levee Safety Program Managers will use their program management plan and ten-year outlook to inform budget and resource planning.

e. The following questions are some considerations that may guide district Levee Safety Program Manager and levee sponsor recommendations to conduct a special inspection, more frequent site visits, or adjust scheduling of formal inspections:

(1) During the most recent inspection, were notable new and/or worsening conditions observed that should be examined by the district sooner than the next scheduled inspection?

(2) Did a recent flood impact the levee, requiring an inspection or site visit to fully understand if or how the levee condition has changed and how it performed during the event?

(3) Could the information provided to USACE from the sponsor's regular inspections be used in place of the upcoming planned site visit or inspection? Are there opportunities for the USACE district to participate in sponsor-led inspections in lieu of the next planned site visit or inspection?

(4) Are there areas of concern identified during the last risk assessment that warrant more frequent site visits or special inspections?

(5) Has a new levee alteration or repair been completed since the last inspection that requires attention or that should be documented to better understand the condition of the levee?

C-4. Who Inspects Levees.

a. USACE inspects federally authorized levees with a team of engineers and technical experts. The size and composition of the team depends on the size, length, and complexity of the levee system.

b. Typically, the USACE inspection team will include engineers and technicians with expertise that aligns with the features of the levee. This can include representation from multiple disciplines, including civil, geotechnical, structural, hydraulic, mechanical, and electrical engineering and geology.

c. District Levee Safety Program staff will select levee inspectors based on their qualifications, the type and purpose of the inspection, and the complexity of the levee. All members of the levee inspection team must meet the following qualifications:

(1) Knowledge of the Levee Inspection Checklist.

(2) Experience using the Levee Inspection System.

(3) Knowledge of the levee's construction, performance history, and features.

(4) Technical expertise in their discipline related to levees.

(5) Knowledge of the Levee Safety Program mission and objectives of levee inspections.

(6) Experience and awareness of best practices for levee inspections.

d. Every levee inspection (formal or special) will have an inspection team lead, who must be a licensed Professional Engineer or Professional Geologist. The inspection team lead is responsible for:

(1) Ensuring levee sponsors are given the opportunity to participate in all aspects of the inspection and are available to operate levee features when necessary.

(2) Managing the logistics of the inspection.

(3) Obtaining access to the levee.

(4) Ensuring all levee features are properly inspected.

(5) Managing the review of the draft levee inspection results.

(6) Compiling the final levee inspection results.

e. For formal or special inspections, the number of USACE inspection team members should allow for a thorough inspection, physically walking the entire length of the alignment, operating inspection equipment and tools, recording observations, and taking inspection photographs throughout the entire levee. At a minimum, the team will include one inspector on the top of the embankment (levee crown) and one inspector along the bottom of each levee slope (levee toe). Levees with larger cross sections may require additional inspectors to assure visibility of the entire levee. If any safety concerns exist (high velocity flows near the toe, significant tripping hazards, etc.), these requirements may be adjusted on a case-by-case basis.

f. The USACE inspection team may also include:

(1) Levee sponsors. As part of developing the program management plan and ten-year outlook, sponsors will have advance notice of planned inspections for their levees and should clarify how they plan to participate. USACE will notify levee sponsors 30 business days in advance of conducting an inspection. For unplanned inspections, driven by more urgent situations such as flood events, USACE districts will provide as much advance notice to the levee sponsor as possible.

(2) Members of the risk assessment team. If there is an ongoing or planned risk assessment for the levee system, members of the risk assessment team should be invited to participate. A levee inspection is key to helping a risk assessment team understand the condition and historical performance of levee.

(3) Representatives from other organizations. In some cases, it may be helpful to include others during the inspection based on the activities associated with the levee. For example, representatives from other USACE programs such as emergency management may find it helpful to participate in an inspection to have a better understanding of the levee's performance during a flood. Federal agencies such as the Federal Emergency Management Agency (FEMA) and levee sponsors may also benefit from participating in an inspection in cases where a community may seek accreditation of the levee in the National Flood Insurance Program. These parties' participation will be coordinated with the levee sponsor prior to the inspection. The district program management plan and pre-inspection activities should help inform when it might be appropriate to include others during levee inspections.

C-5. Inspecting Levees as Systems.

a. Levees often operate as a system keeping water out of a shared area (also called the leveed area). The success of the system depends on the condition and performance of each individual segment that is part of it. Because of this, USACE inspects the individual segments that make up a system together.

b. In cases where a levee is part of a system, USACE will inspect the entire system at one time or within a relatively short timeframe depending on the length or number of individual levee segments. USACE will work with sponsors for the individual levee segments in advance of, during, and after the inspection to coordinate and review the results of the inspection.

c. Although levees that compose a system are inspected together, the results and ratings of specific items evaluated are summarized separately for each segment. USACE will prepare inspection reports for each individual levee segment. In cases where a finding or recommendation relates to the system of levees, USACE will work with the sponsor or entity responsible for each levee segment to support understanding of and actions to address areas of concern that most impact future levee performance. USACE will also identify those actions that the levee sponsor is responsible for that will best manage their levee segments.

d. In some cases, levees include man-made high ground that the levees ties into, referred to as non-project segments. This can include a railroad, roadway, or another embankment often referred to as non-project segments. These structures help keep water away from a shared area even though they are not necessarily designed or legislated to be part of the federally authorized project.

e. If a non-project segment is unable to withstand flood waters, the leveed area can be flooded. Monitoring their condition can help USACE and levee sponsors watch for weak points in the system and work to address them in collaboration when possible.

f. USACE and levee sponsors will work to inspect non-project segments when they are accessible. In cases where the non-project segment cannot be accessed, the inspection team will record observations based on what is visible.

C-6. Conducting Levee Inspections: The Levee Inspection System.

a. USACE inspects levees using a standard process and checklist. To support consistent use and application of the USACE inspection checklist, inspection teams use the Levee Inspection System, a geographic information system, or GIS, software available on global positioning system, or GPS, enabled tablets and devices.

b. The Levee Inspection System is linked to the National Levee Database. Before an inspection starts, the inspection team can load data from the National Levee Database to inform the current inspection. This can include the levee alignment, features, and information about the leveed area.

c. Inspectors can use one or more devices with the Levee Inspection System to conduct the inspection, documenting initial observations, locations of issues with the levee, and taking photographs. The Levee Inspection System User Guide provides more information on how to set up and use the Levee Inspection System during an inspection: https://levees.sec.usace.army.mil/#/inspection-system/tools-v4.

d. Data entered in the Levee Inspection System can be synced to the National Levee Database, which can be used to review observations, assign an item rating, and generate an initial draft report that summarizes the results. Raw inspection data in the National Levee Database is available to levee sponsors through their unique log-in but is not publicly viewable.

C-7. Documenting the Inspection: Inspection Ratings.

a. During the inspection, the inspection team records and documents observations, such as an area of high grass, a set of animal burrows, or a well-maintained culvert outlet, for each item in the levee inspection checklist. After the inspection is completed, all inspection observations related to a specific item are grouped together to provide an overall item rating.

b. The inspection lead is responsible for finalizing the levee inspection results and will consult inspection team members and other technical subject matter experts as needed for reviewing ratings and documenting final conclusions. All observation descriptions and ratings will then be reviewed and verified or edited to ensure consistency with field conditions and rating guidelines and to ensure appropriate photo(s) are included with each observation.

c. The recorded observations for each item will be assessed collectively to determine the overall rating for each item. When appropriate, information provided by sponsor inspections, flood performance, and testing should also be considered when determining overall item ratings.

d. The inspection team will be required to exercise judgment when determining a component item rating. A summary rationale to justify each item rating must be included in the final inspection results.

C-8. Inspection Results and Products.

a. Within 90 days of completing the field inspection of the entire levee system, a final consolidated set of inspection results and products will be compiled and provided to levee sponsors:

(1) Transmittal letter (optional). Districts have the flexibility to include a transmittal letter, signed by the most appropriate signatory, to provide a summary and serve as a cover letter when providing levee inspection products to others, such as levee sponsors or FEMA. To maximize efficiency, districts are encouraged to include a levee sponsor's eligibility determination for the USACE Public Law (PL) 84-99 Rehabilitation Program within the set of inspection deliverables, if applicable. A coordinated transmittal letter with USACE emergency management can serve this purpose. This should simply and succinctly describe any issues and areas of focus on the levee.

(2) Inspection report. A separate inspection report will be prepared for each individual levee segment. Inspection reports will include, at minimum, the Levee Inspection Report generated by the Levee Inspection System (also referred to as the Advanced Report in the Levee Inspection System), levee maps identifying locations of each observation, and tables populated with the most current information associated with the segment's pipes, gates, relief wells, toe drains and/or closures, as applicable.

(3) Levee risk management summary (see Appendix E). The district will consider all results from each levee segment inspection in conjunction with the best available risk assessment and update the levee risk management summary. Based on the complexity of the levee, notable changes in condition, and other factors potentially impacting levee risk, the Levee Safety Program Manager should determine the appropriate individuals to be engaged in developing and updating the comprehensive recommended actions that will be included in the levee risk management summary and include the levee sponsor.

(4) Risk assessment results. The district will provide levee sponsors a copy of the results of the most recently completed risk assessment and discuss those actions that will be most effective within each entity's authorities to manage risk for their specific segments.

b. All final inspection results and products will be stored in the National Levee Database and must be approved by the district Levee Safety Officer, who may delegate approval to the district Levee Safety Program Manager. District Levee Safety Program Managers will ensure levee sponsors have access to results of levee inspections in the National Levee Database and be available to review the results together.

c. Inspections results and the PL 84-99 Rehabilitation Program.

(1) The PL 84-99 Rehabilitation Program provides for repair of eligible flood risk management projects and constructed coastal risk management projects damaged by natural disasters. The criteria for a levee to be eligible for the PL 84-99 Rehabilitation Program is based on items evaluated during a levee inspection.

(2) Consistent with the interim guidance issued in 2014, USACE determines eligibility for the PL 84-99 Rehabilitation Program using a subset of inspection items (18 specified items) in the existing USACE levee inspection checklist. Levees only receive a rating for the items they have.

(3) These items must receive acceptable or minimally acceptable ratings for the levee to be eligible for the PL 84-99 Rehabilitation Program. Continuing eligibility for the PL 84-99 Rehabilitation Program will be reviewed any time a Levee Safety Program inspection is completed or as requested by the levee sponsor and coordinated with the PL 84-99 Rehabilitation Program.

(4) USACE Levee Safety Program staff inspecting levees potentially eligible for the PL 84-99 Rehabilitation Program will notify the district emergency manager, responsible for PL 84-99 Rehabilitation Program activities within the district, and the levee sponsor of any findings that inform eligibility of the levee in the program.

(5) Guidance for determining eligibility in the PL 84-99 Rehabilitation Program is detailed in Engineer Regulation 500-1-1 and the Interim Policy for Determining Eligibility Status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to PL 84-99.

d. Inspection results and FEMA National Flood Insurance Program Levee Accreditation.

(1) As part of the National Flood Insurance Program, levees that meet certain design, data, and documentation requirements described in Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10) can be accredited by FEMA. Some information gathered during an USACE levee inspection can be used by a community to meet a sub-set of the requirements for accreditation.

(2) During levee inspections, USACE will evaluate a subset of National Flood Insurance Program criteria related to operation and maintenance plans, closure operation and interior drainage, and flood warning procedures.

(3) For each criterion, USACE will indicate whether there is a positive or a negative finding. A positive finding means that the specific criteria in 44 CFR 65.10 is met and that the sponsor can use that information for submitting an accreditation package to FEMA. A negative finding means the specific criteria is not met and the information may be communicated with FEMA.

(4) USACE will coordinate with the levee sponsor prior to communicating inspection findings with FEMA. At any time, if a levee sponsor has resolved an issue that would result in a negative finding becoming positive, the sponsor or community may work with USACE to reevaluate the specific criteria.

(5) Interim guidance related to National Flood Insurance Program accreditation may be found in Engineer Construction Bulletin 2019-11, Transition Guidance for Levee System Evaluations for the National Flood Insurance Program.

C-9. Site Visit Procedures.

a. A site visit is a collaborative activity at a levee system to focus on a particular area of concern, observe or verify any changed conditions, or capture progress on actions for consideration in the next more detailed inspection. A site visit can be conducted at any time. It is intended to provide the flexibility to conduct a visual observation of the levee system between formal inspections.

b. USACE districts will notify sponsors at least 30 business days in advance of the site visit when possible and every effort will be made to accommodate the levee sponsor's schedule so they are able to attend. The district, in coordination with the levee sponsor, will determine the extent and detail of the site visit in addition to what expertise are needed to participate on the site visit. Observations and photographs will be documented in a site visit summary form reviewed with the sponsor and finalized by the district Levee Safety Program Manager. A site visit summary will be the final product for a site visit and will be provided to the levee sponsor within 30 days of the site visit.

Appendix D
Risk Assessments

D-1. Purpose. The purpose of this appendix is to describe U.S. Army Corps of Engineers (USACE) risk assessments, including why and how they are done, who is involved, and how information from them can be used (see Figure D-1 for a summary of information contained in Appendix D).

Figure D-1. Information contained in Appendix D

D-2. General Information About Risk and Risk Assessments.

a. Floods.

(1) Dams and levees protect people and property from floods, ensure major rivers are navigable, generate hydropower, provide recreation, provide reliable water sources for the nation, and conserve fish and wildlife.

(2) These structures provide enormous benefits to society. Each year, they prevent an average of $92.4 billion in flood damages in the U.S. Levees have provided most of this protection in the U.S. (see Figure D-2).

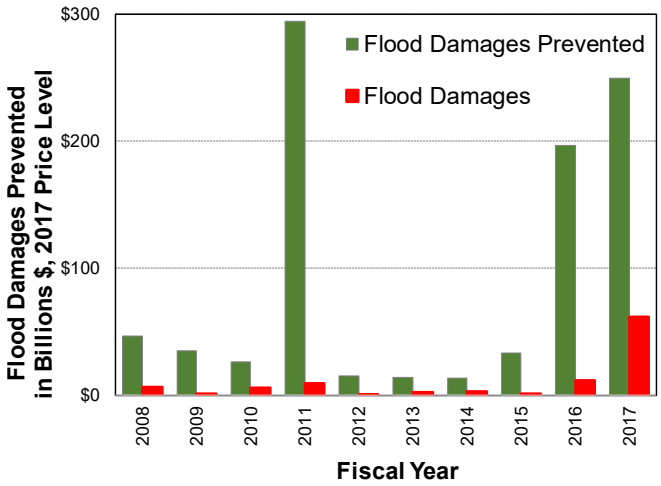


Figure D-2. Flood damages prevented by fiscal year

b. Historical failures and incidents.

(1) Although valuable to the nation, these structures could create life-threatening situations if failure were to occur. Some could also create life-threating situations by operating normally. This has happened hundreds of times across the world – including to levees managed or owned by USACE.

(2) A close look at those failures or major incidents led to the following observations:

(a) The majority of structures in the USACE inventory perform well during floods.

(b) Dams and levees are systems composed of individual features.

(c) Good performance requires that all the features of dams and levees work together.

(d) Many structures that failed or had serious incidents met all the relevant design standards.

(e) Until the late 1990's, there was no coherent method to evaluate these features as an entire system.

c. A new approach.

(1) In coordination with industry and international standards of practice, USACE has been improving the way it looks at levees. As a part of this evolution, USACE adapted processes from a variety of sources including:

(a) Other federal agencies.

(b) Dutch levee and flood safety practices.

(c) Australian dam and flood safety practices.

(d) United Kingdom industrial safety practices.

(e) Other industry approaches to safety – namely nuclear, aviation, and insurance.

(2) USACE ultimately chose a risk-informed approach to safety for dams and levees. The use of risk assessments resulted in more transparency in both the safety evaluations and the resulting decisions. In addition, risk assessment allowed for the evaluation of how levees could fail that do not fit within deterministic criteria-based analysis or a pure comparison to design standards – USACE now focuses its analyses around *potential failure modes* (see Figure D-3). Some of the most common potential failure modes are:

Failure mode – a structured way to describe a chain of events that leads to a levee failure.

(a) Piping and internal erosion of soil embankments or foundations.

(b) Stability of embankments and flood walls.

(c) Interactions between concrete structures and embankments.

(d) Overtopping and breach of embankments.

(e) River-side erosion and scour of slopes.

(f) Failure due to operational issues such as inability to access and operate gates and closures.

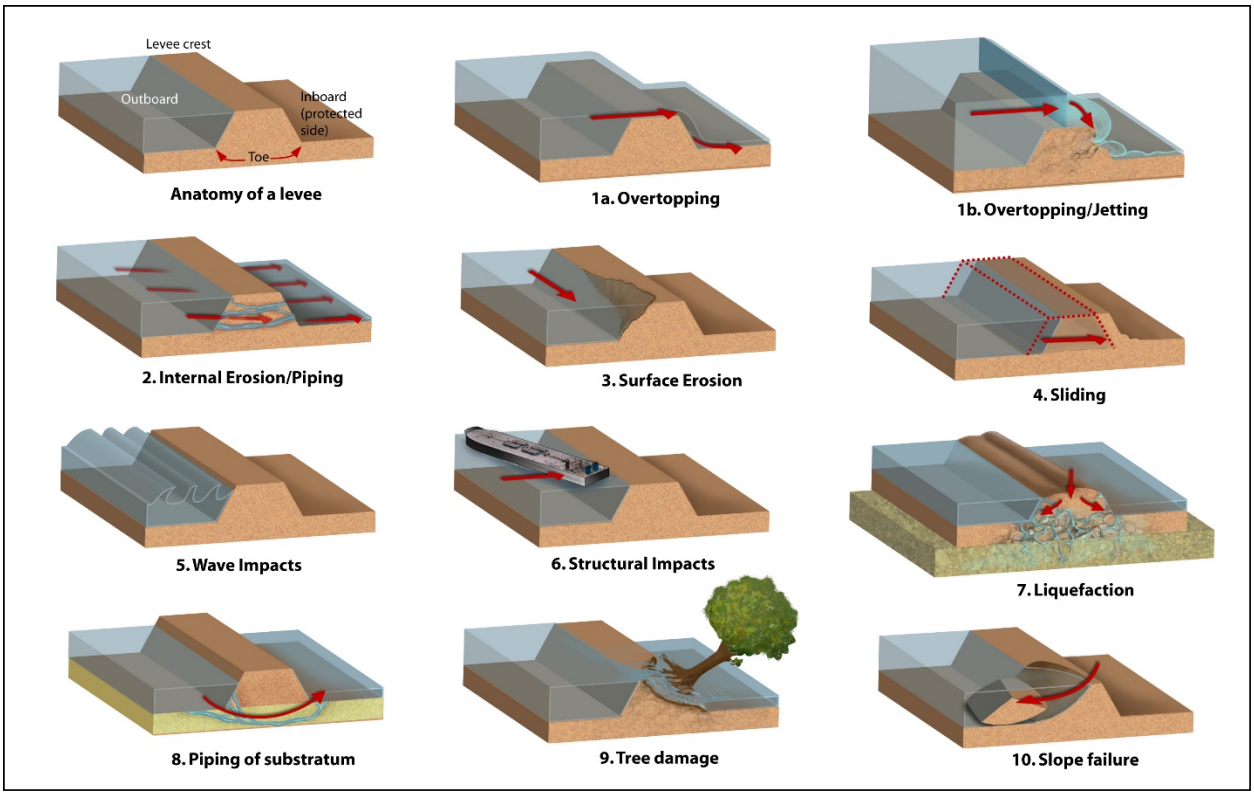


Figure D-3. Some ways levees fail (Zina Deretsky, National Science Foundation)

(3) In general, using risk to inform the evaluation of levees has resulted in the following:

(a) A better understanding of levees nation-wide and ability to put resources where they are most needed and most effective in reducing risk.

(b) More transparency in the evaluation of risks and implementation of measures to reduce those risks.

(c) A better understanding of what is driving the risks at a given structure, and whether those risks require more attention and prioritizing limited resources.

(d) Reducing expenditures on activities which do little to reduce risk.

(e) Focusing resources where they will have the most impact.

(f) Effectively reducing risk in a cost-effective manner.

(g) Improved flood fighting plans.

(h) Improved communications with emergency management agencies.

(i) Improved operation and maintenance activities – focusing on areas where risks are the highest.

(4) USACE now uses risk as a means to support all dam and levee safety decisions.

(5) Evaluating risk does not imply that levees are risky infrastructure. In fact, they are constructed as a means to help manage flood risk. Instead evaluating risk helps owners and sponsors of infrastructure, and the public to understand and quantify the level of risk that still exists with and because of the presence of the infrastructure.

d. Flood risk and levee risk.

(1) The term *flood risk* is used in USACE to describe the risk of flooding in the area behind the levee regardless of what led to that flooding. The term *levee risk* is used to refer to the risk posed by the levee system itself. When flooding in a leveed area occurs, it will be flooded from one of four scenarios, referred to as *inundation scenarios* (see Figure D-4).

(2) These four inundation scenarios are:

(a) Breach prior to overtopping – the levee breaches from a defect within the system.

(b) Overtopping with breach – the levee overtops then breaches due to erosion.

(c) Malfunction or improper operation of levee system components – a component of the levee fails, usually a pump station or closure structure.

(d) Levee overtopping without breach (also referred to as non-breach) – floods exceed the capacity of the levee, but the levee does not breach.

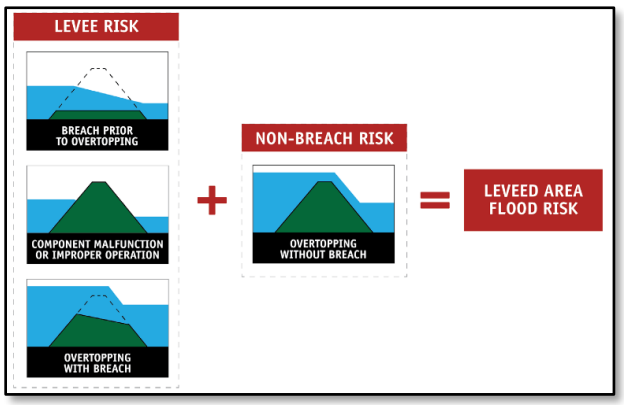


Figure D-4. Four leveed area inundation scenarios

(3) Leveed areas can also be flooded from the protected side when rainfall exceeds the capacity of the interior drainage features. This is evaluated during risk assessments done to support National Flood Insurance Program recommendations for accreditation but is not typically done for other risk assessments.

e. Terminology.

(1) Sometimes the words used to describe different aspects of risk can be confusing. Different industries and people use different terms that they are the most comfortable with. USACE has chosen definitions that are the most common in the water resources industry.

(2) Below (Table D-1) are some common words that are also used, and the corresponding words used by USACE.

Table D-1
Common Risk Terminology

Term Used by USACE	**Other Terms Used Synonymously**
Levee Risk	Incremental Risk Structure Risk Breach Risk
Flood Risk	Residual Risk Total Risk
Non-Breach Risk	Overtopping Risk Flood Risk Residual Risk

f. Components of risk.

(1) A risk assessment is a means to determine the most likely ways a levee might fail and how likely that failure is to occur, quantify the impacts within a community if failure were to occur, and quantify the benefits of having the levee. Flooding occurs when flood waters rise high enough that they flow over and, often, erode the levee. In other cases, the flooding occurs before the flood waters reach the top due to a defect or flaw within the levee structure. Flooding may also occur because a pipe, gate, or closure has malfunctioned.

(2) During a risk assessment, USACE estimates the likelihood of each of these flooding scenarios. A risk assessment also identifies the total number of people living and working behind a levee as well as the number of properties and their value to determine what potential losses may occur in the event of flooding and to quantify the benefits that come from having the levee.

(3) All risk assessments follow the same basic framework of examining the potential hazards, condition and performance, benefits, and consequences should an issue occur (see Figure D-5).

Figure D-5. The components of risk

(4) All levee safety risk assessments follow methods developed and released by the USACE Risk Management Center and industry partners. The methods are consistent within USACE and aligned with other agencies, industries, and nations. The methods are reviewed regularly by experts outside USACE. More detailed information about risk assessment methods and calculations can be found at the Risk Management Center's website(www.rmc.usace.army.mil).

D-3. When Would We Do a Risk Assessment.

a. Possible purposes of a risk assessment (Figure D-6).

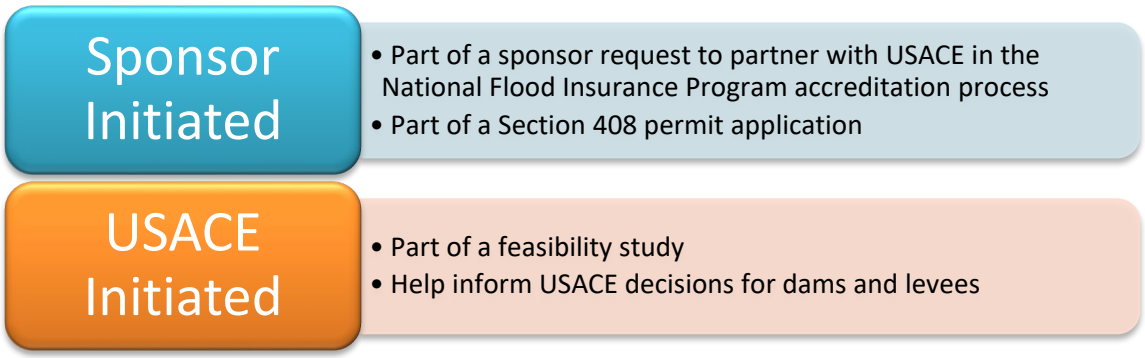


Figure D-6. Possible purposes of a risk assessment

(1) Risks are assessed for dams or levees to inform a variety of decisions by USACE. The most common are:

(a) Emergency Preparedness. Information from risk assessments can be used to plan for evacuation routes, flood fighting techniques, and priority areas for monitoring during highwater events.

(b) Scalable Requirements. Risk assessments are used by USACE to support decisions about scope and detail of data collection, analyses, modeling, and increasing or decreasing minimum design requirements. Greater risk, complexity, or cost may require greater analytical detail.

(c) Portfolio Management. USACE uses risk assessments to understand the risk across the entire USACE inventory of levees and prioritize actions and investments. This can help prioritize studies, improve operation and maintenance activities, and improve communications with levee sponsors and the public.

(d) Feasibility Studies. Risk assessments are required to support USACE feasibility studies. Life safety risks and benefits (and other social effects), economic risks and benefits, and environmental risks and benefits are commonly used to evaluate different alternatives.

(e) Levee Accreditation for the National Flood Insurance Program. USACE will evaluate certain criteria related to levee accreditation during every type of risk assessment. In addition, levee sponsors of federally authorized levees can choose to cost share a risk assessment with USACE to develop supporting information for an accreditation recommendation to the Federal Emergency Management Agency (FEMA) under the National Flood Insurance Program.

(f) Section 408 Requests. Depending on the scope and scale of a Section 408 request involving a federally authorized levee, risk assessments may be required to support the USACE Section 408 decision.

(2) There are a variety of other reasons to perform a risk assessment on a federally authorized levee. But regardless of the purpose it is important for USACE and the levee sponsors to agree to the following items before a risk assessment starts:

(a) What decision is being made and who is making that decision.

(b) What the appropriate level of effort is to support that decision.

(c) The roles of all the participants in the process.

(d) Identify the funding.

(3) Ensuring a common understanding of the scope with levee sponsors is the single most important factor for a successful risk assessment. The most common reason for dissatisfaction with a risk assessment is the *failure for USACE and the local sponsor to adequately scope the effort together.*

(4) Figure D-7 summarizes the key steps in a risk assessment.

Figure D-7. Key steps in a risk assessment

b. Types of risk assessments.

(1) There are three different types of risk assessments: screening, semi-quantitative (sometimes abbreviated as SQRA), and quantitative (sometimes abbreviated as QRA).

(2) The level of information and the amount of uncertainty reflected in the risk will vary by the type of assessment. As the type of risk assessment becomes more detailed, the accuracy of the risk estimate improves.

(a) Screening: a simplified risk assessment that relies on existing data, historical performance, engineering judgment, and assumes pre-defined performance modes to quickly characterize levee risk. Users combine inspection information with existing, readily available hazard(loading), condition and performance, and consequence information to describe the performance of a levee and the consequences of flooding. Screening risk assessments are completed using the Levee Screening Tool (see Figure D-8).

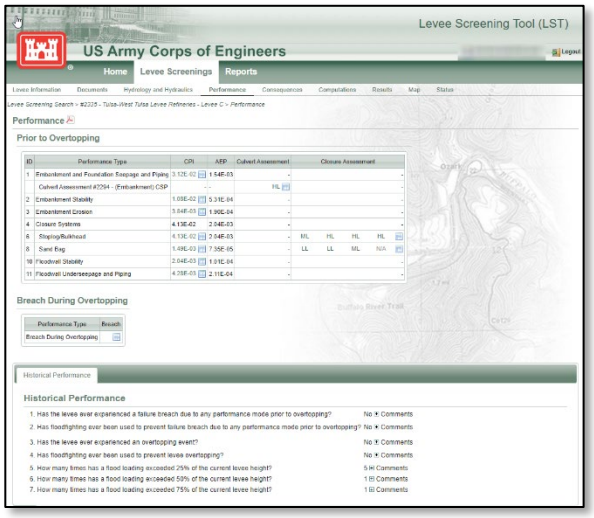


Figure D-8. The Levee Screening Tool – used to complete all USACE screening risk assessments

(b) Semi-quantitative: uses currently available information but may also involve gathering new information to inform its findings. These risk assessments transition from choosing pre-defined performance modes to identifying failure modes specific to the levee. This results in a more accurate estimate of risk and a more thorough understanding of the system.

(c) Quantitative: requires a greater level of effort; it uses currently available information but may also involve gathering new information to inform its findings, considers custom failure modes specific to the levee, and results in the most accurate estimate of risk. Typically, this can be most appropriate for levee systems where the cost to implement actions on the levee exceeds $100 million or the population behind the levee is more than 1,000 people.

Regardless of the reason to do a risk assessment, it is USACE's intention to choose the type of assessment that takes the least amount of effort to get the intended result.

(3) The following table (Table D-2) summarizes the types of risk assessments and associated level of effort and roles.

Table D-2
Types of Risk Assessments and Associated Level of Effort and Roles

Type of Risk Assessment	Level of Effort and Roles
Screening	• Low effort • Average team includes two to four people • The USACE district leads the assessment with the levee sponsor • Results reviewed by USACE national cadre • Most effort is in documentation • Team enters information into the USACE Levee Screening Tool
Semi-quantitative	• Medium effort • Average team includes ten people • One or two USACE-approved facilitators lead the effort • Team includes USACE district and the levee sponsor or USACE risk cadre, USACE district, and the levee sponsor • Results reviewed by USACE national cadre • Most effort is in understanding failure modes • Teams use spreadsheets and some custom software
Quantitative	• The amount of effort varies – but these analyses can sometimes require intense effort • Average team includes 15 people • Two USACE-approved facilitators lead the effort • Team includes USACE risk cadre, USACE district, and the levee sponsor • Results reviewed by USACE cadre or panel of experts • Most effort is in analyzing the levee or foundation • Teams use spreadsheets and custom software

D-4. Who Participates in a Risk Assessment.

a. A variety of individuals and entities can participate in risk assessments. Although USACE may employ or contract with a variety of national experts to perform risk assessments, local USACE districts and levee sponsors know more about their system, operation, and past performance. Their participation, and the knowledge they bring to the assessment, is critical to the understanding and assessment of risk.

b. Below is a description of potential participants in risk assessments and a broad overview of their roles. This table (Table D-3) is intended to be a generalized guide. It is important for USACE and the levee sponsors to agree on the roles of the participants prior to starting a risk assessment.

Table D-3
Potential Participants in Risk Assessments and Their Roles

Entity	Role in the Risk Assessment
Levee Sponsors	Representatives of or levee sponsors themselves are encouraged to participate. Levee sponsors bring critical information to the risk assessment regarding the levee and its operation. The level of participation is up to the sponsor.
Consultants Employed by Levee Sponsors	Consultants employed by levee sponsors can participate in any risk assessment involving their levee. Their level of participation is up to the sponsor.
FEMA Regional Staff	Staff from local FEMA regions can attend risk assessments.
Emergency Management Agencies	Representatives from local emergency management agencies can participate in any risk assessment. Their participation will be coordinated between the levee sponsor and USACE district.
USACE Local District Subject Matter Experts	USACE district subject matter experts should participate in any risk assessment involving levees in their district's area of responsibility. USACE districts can facilitate risk assessments with the approval of the Risk Management Center.
USACE National Centers	Representatives from national centers lead or participate in all types of risk assessments. Many times, facilitators are provided by the national centers.
USACE Headquarters	USACE headquarters staff may participate as part of the risk assessment team, but this is unlikely. Headquarters coordinates peer reviews of all risk assessments.
Consultants Employed by USACE	Consultants employed by USACE can participate at USACE's discretion. The level of participation is up to USACE.

D-5. What Happens Before Risk Assessments.

a. Regardless of the type of risk assessment being conducted, teams gather and develop information in the following categories (Figure D-9):

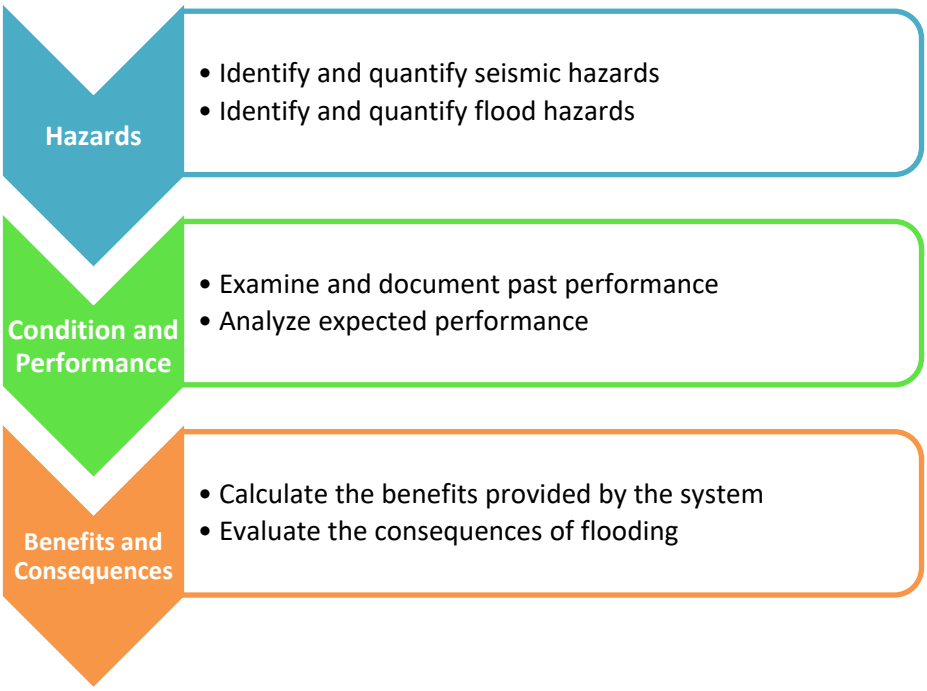


Figure D-9. Risk assessment information categories

b. Some types of supporting documentation or information might include:

(1) Design documentation and analyses.

(2) As-built drawings.

(3) Inspection reports.

(4) Levee component testing plan and results.

(5) Performance history documents and photos.

(6) Survey information.

(7) Maps.

(8) Project drawings and reports.

(9) Design memoranda.

(10) Local or regional flood frequency studies and reports.

(11) Historical flood records.

(12) Operation and maintenance (O&M) manuals.

(13) O&M records.

(14) Hydraulics and hydrology data.

(15) Geotechnical data.

(16) Structural data.

(17) Information about what is in the leveed area.

c. This information may be found in the National Levee Database, district files, levee sponsor files, on public webpages, local libraries, county and state public records, consultant offices files, and project office files. The amount of information varies by levee, levee sponsor, and local USACE district. The amount of effort put into developing supporting information should be discussed when the risk assessment scope is determined.

d. Screening risk assessments.

(1) Information is collected and prepared before risks are estimated using the USACE Levee Screening Tool. Historical performance, hydrology, operation and maintenance history, as-built drawings, construction activities, and other relevant information is compiled and entered into the Levee Screening Tool. If the levee system has not been surveyed and entered into the National Levee Database, this is typically done before the risk assessment.

(2) Preparation for screening risk assessments is led by the local USACE district. The following table (Table D-4) summarizes the roles for preparing for a screening.

Table D-4
Roles for Preparing for a Screening Risk Assessment

Sponsor and Their Consultants	Local USACE District and Their Consultants	Other USACE Elements
• Decide on level of participation • Coordinate input and background information with the local USACE district	• Coordinate and assemble the background information about the levee being evaluated including hydrology, performance, analyses, and other relevant background information • Enter the supporting information into the National Levee Database and Levee Screening Tool	• Ensure the corporate tools – primarily the National Levee Database and the Levee Screening Tool – are available • Provide support as needed

e. Semi-quantitative and quantitative risk assessments.

(1) Preparation for semi-quantitative or quantitative risk assessments are done at the local level by the local USACE district and the risk assessment facilitator with coordination with the levee sponsor. Often, national teams called *risk cadres* support these risk assessments. These teams also participate in the preparation phase.

(2) A significant amount of information is prepared before risks are estimated. Historical performance, hydrology, operation and maintenance history, as-built drawings, construction activities, and other relevant information is compiled and entered into ProjectWise. The Modeling, Mapping, and Consequences Production Center develops an initial consequence estimate for different failure scenarios. If the levee has not been surveyed and entered into the National Levee Database, this is typically done prior to the risk assessment. The following table (Table D-5) summarizes the roles for preparing for a semi-quantitative or quantitative risk assessment.

USACE has ten risk cadres that support risk assessments nation-wide. These cadres work across the country, get extensive training, and are familiar with USACE and industry risk assessment practices.

Table D-5
Roles for Preparing for a Semi-quantitative or Quantitative Risk Assessment

Sponsor	Local USACE District	Other USACE Elements
• Decide on level of participation • Coordinate input and background information with the local USACE district	• Coordinate and assemble the background information about the structure being evaluated including hydrology, performance, analyses, and other relevant background information • Ensure the local sponsor and FEMA are invited to the risk assessment • Enter the supporting information into the National Levee Database and ProjectWise	• Ensure the facilitator is appropriate for the risk assessment • Lead preparation meetings between the sponsor, local USACE participants, and other parties • Ensure flood and earthquake hazards are prepared and ready • Ensure initial consequence assessment is ready for the risk assessment

D-6. What Happens During Risk Assessments.

a. Screening risk assessments.

(1) Once the background information is prepared, it is entered into the Levee Screening Tool. This is done by the USACE district in coordination with the levee sponsor. The tool is used to quickly estimate the probability of failure compared to an average levee in the USACE portfolio.

(2) Screenings provide limited information that can inform National Flood Insurance Program levee accreditation decisions but do not satisfy all the requirements of 44 Code of Federal Regulations (CFR) Section 65.10. Each time a district conducts a levee screening, it will identify when a levee segment meets or does not meet a specified subset of requirements in 44 CFR Section 65.10 as identified in the Levee Screening Tool by providing a positive, negative, or inconclusive finding.

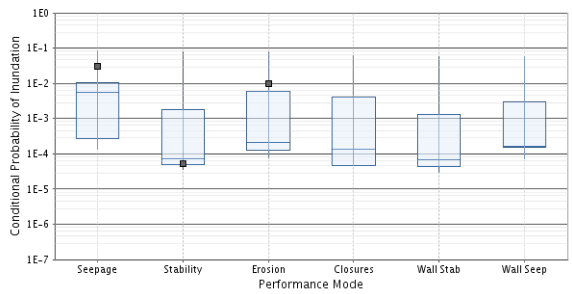
(3) Once completed, the facilitator submits the screening for district and division review, followed by a review by a national cadre of experts to promote consistency across the enterprise in the understanding of risk for levees.

(4) The following table (Table D-6) summarizes the roles for conducting a screening risk assessment.

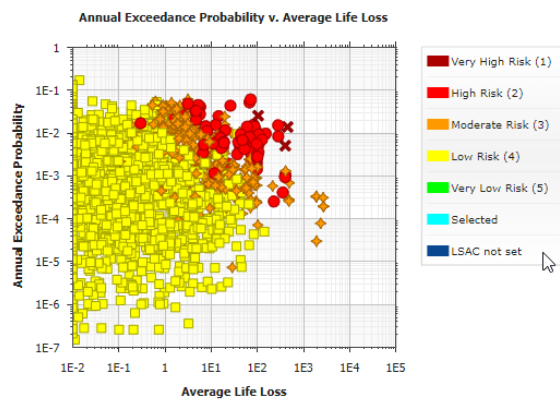
Table D-6
Roles for Conducting a Screening Risk Assessment

Sponsor	Local USACE District	Other USACE Elements
• Participate with the local USACE district when the risk is evaluated using the Levee Screening Tool • Work with USACE to draft a prioritized list of recommendations • Review the results with the local district	• Facilitate the screening • Request assistance from the national team as needed • Work with the sponsor to draft a prioritized list of recommendations	• Ensure the corporate tools – primarily the National Levee Database and the Levee Screening Tool – are available • Provide support as needed • Results reviewed by USACE national experts

(5) The two charts below are examples of some results from a screening (Figure D-10):



Levee risks for a segment by performance mode compared to the USACE levee portfolio



The total risk for each segment in the USACE levee portfolio

Figure D-10. Example screening risk assessment results

(6) A high-risk levee doesn't necessarily mean that the levee itself is in poor repair or not maintained. It may also reflect the value of what the levee protects and its importance to the nation. It may lead USACE and the sponsor to focus on communicating the critical nature of the levee to the population behind it.

b. Semi-quantitative risk assessments.

(1) A key step of a semi-quantitative risk assessment is a meeting that takes place over the course of a week or several weeks depending on the complexity of the system. A trained facilitator guides the team through a structured process to:

(a) Understand the hazards.

(b) Identify ways the system could malfunction or fail (failure modes).

(c) Assess the relative likelihood(risk) of those events.

(d) Identify the consequences of those events.

(2) Risk estimates for semi-quantitative risk assessments are plotted as boxes representing order-of-magnitude estimates for the likelihood and consequences. These estimates are displayed on risk matrices to represent:

(a) Each risk-driving potential failure mode.

(b) Total levee risk.

(c) Overtopping without breach.

(d) Total flood risk.

(3) Examples of these risk matrices are shown below (Figure D-11).

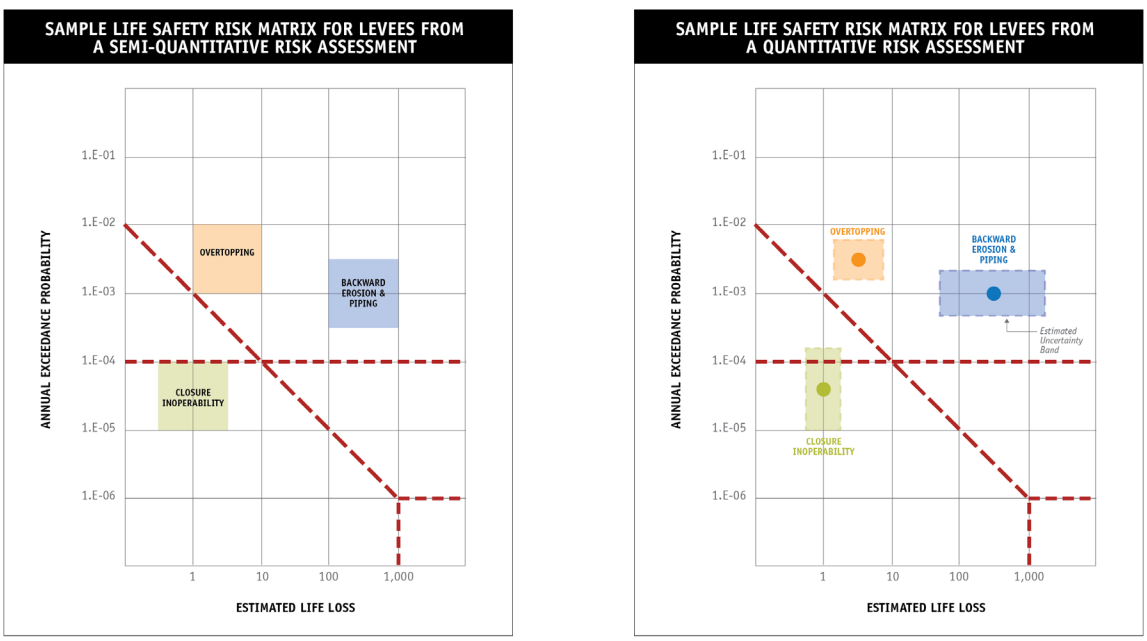


Figure D-11. Example risk matrices from a semi-quantitative risk assessment

(4) The following table (Table D-7) summarizes the roles for conducting a semi-quantitative risk assessment.

Table D-7
Roles for Conducting a Semi-quantitative Risk Assessment

Sponsor	Local USACE District	Other USACE Elements
• Participate in the risk assessment at their discretion • Work with USACE to draft a prioritized list of recommendations • Review the report	• Participate in the risk assessment • Provide subject matter experts for the risk assessment • Work with the sponsor to draft a prioritized list of recommendations • Complete the report	• Facilitate the risk assessment • Provide expertise when it isn't available at the local district or when requested • Results reviewed by USACE national experts

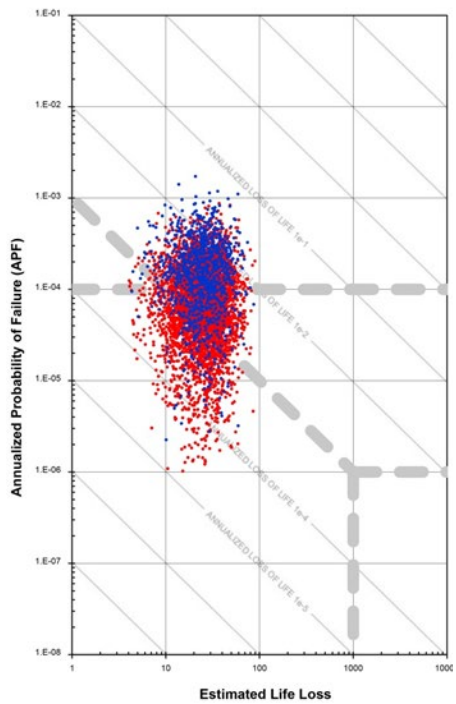
(5) Following this meeting, the team prepares a report. A copy of this draft report will be provided to the team, the local district, and the local sponsor 30 days before starting the national review process.

c. Quantitative risk assessments.

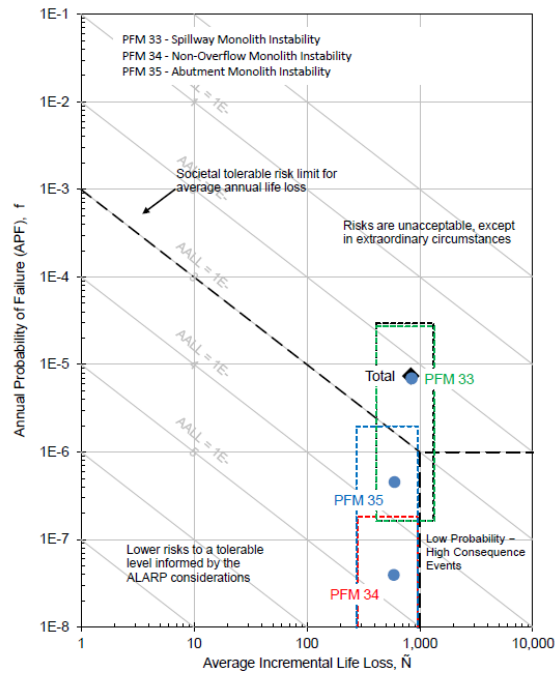
(1) Quantitative risk assessments are customized to the purpose and scope of the assessment. Experts are chosen from across USACE to provide specific experience related to the system being evaluated. It is critical that local sponsors and those familiar with the operation and maintenance of structures are involved with these risk assessments; their expertise with the levee system is valuable to the process. The level of involvement is up to the sponsor.

(2) The beginning of these assessments is very similar to semi-quantitative risk assessments and includes a meeting and generating the same matrices. However, the teams then create custom event trees to describe each failure mode including detailed examinations of uncertainty.

(3) Considerable effort is put into characterizing risks, uncertainties, and choosing ways to portray those risks to USACE and local sponsors. Some examples of how risks are portrayed in quantitative risk assessments are shown below (Figure D-12).



Monte Carlo Simulation Results



Uncertainty Results

Figure D-12. Example risk matrices from a quantitative risk assessment

(4) The following table (Table D-8) summarizes the roles for conducting a quantitative risk assessment.

Table D-8
Roles for Conducting a Quantitative Risk Assessment

Sponsor	Local USACE District	Other USACE Elements
• Participate in the risk assessment at their discretion • Work with USACE to draft a prioritized list of recommendations • Review the report	• Participate in the risk assessment • Provide expertise in the system being assessed • Provide an internal review of the report	• Facilitate the risk assessment • Provide expertise in the relevant areas • Work with the sponsor to draft a prioritized list of recommendations • Complete the report • Results reviewed by USACE national experts or an external panel of experts

(5) Following the meeting, the team prepares a report. A copy of this draft report will be provided to the team, the local district, and the local sponsor 30 days before starting the national review process.

(6) Each semi-quantitative and quantitative risk assessment will include an analysis related to levee accreditation for the National Flood Insurance Program. A recommendation related to levee accreditation for the National Flood Insurance Program will be made if the results of a risk assessment have a sufficient level of assurance. See USACE Engineer Construction Bulletin 2019-11 (https://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb/usace-ecb-2019-11) for USACE criteria for making a National Flood Insurance Program levee accreditation recommendation using a semi-quantitative and quantitative risk assessment.

(7) For any type of risk assessment, USACE and levee sponsors will evaluate all risk assessment information and develop a prioritized list of recommended actions for levee operation, maintenance, repair, replacement, and rehabilitation, and building risk awareness. USACE and the sponsor will identify actions specific to individual levee segments.

D-7. What Happens After Risk Assessments.

a. After any risk assessment, USACE follows the same general process outlined below (Figure D-13):

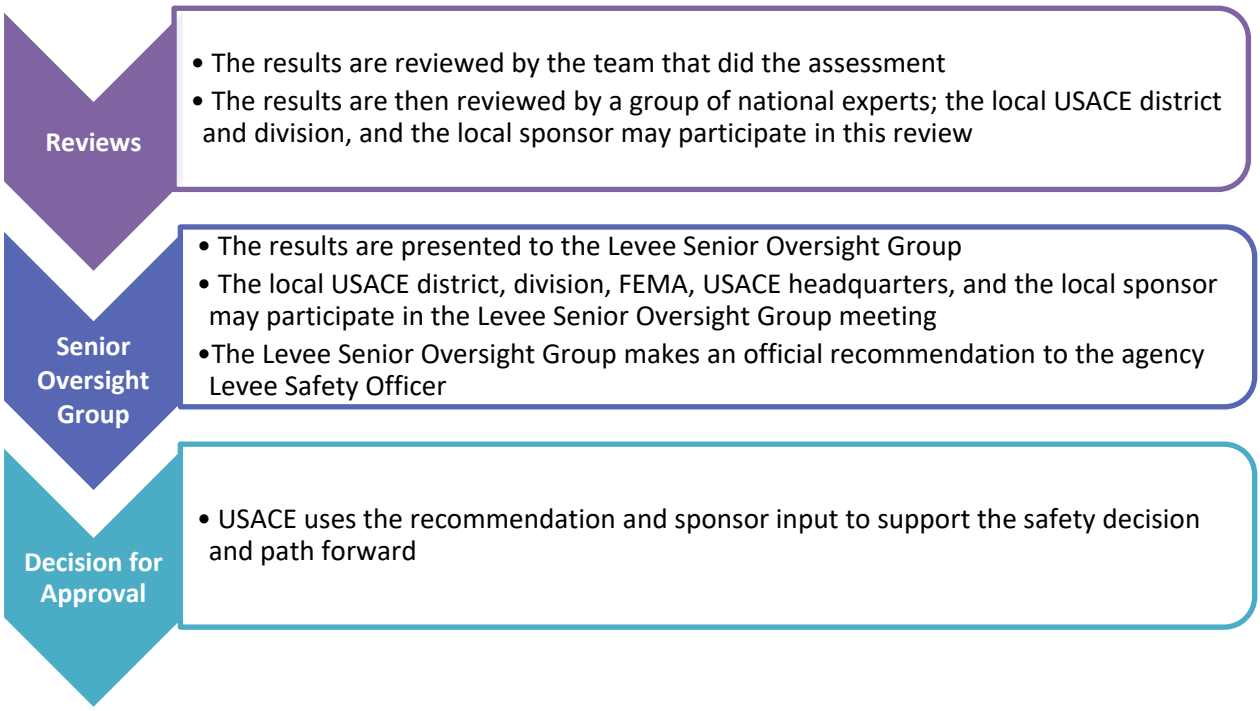


Figure D-13. Post-risk assessment process steps

b. Levee Senior Oversight Group.

(1) The Levee Senior Oversight Group consists of USACE staff representing key disciplines in levee safety and provides recommendations to the USACE headquarters Levee Safety Officer and deputy Levee Safety Officer on levee risk characterizations; prioritization of levee federal investments; direction for levee projects with high potential life safety risk; and, other levee safety matters. The group typically makes recommendations with respect to the following activities:

(a) Screening level risk assessments.

(b) Semi-quantitative risk assessments.

(c) Quantitative risk assessments.

(d) Section 408 alterations with high life safety risks.

(e) Studies or design related to levee systems.

(f) Portfolio risk management priorities.

(g) Design deviations.

(h) Projects with existing risk assessments and baseline risks appearing to change.

(i) Policy issues.

(j) Other topics identified by the USACE headquarters Levee Safety Officer and deputy Levee Safety Officer.

(2) In addition to making these recommendations, the group classifies each structure within the portfolio to help USACE prioritize its resources. *This classification has no other purposes and should not be used to communicate risk.* This classification is called the Levee Safety Action Classification (see Table D-9).

Table D-9
Levee Safety Action Classification Table

Risk Classification		Actions for Levee Systems and Leveed Areas in this Class (Adapt actions to specific levee system conditions.)	Risk Characteristics of this Class
Very High (1)		Based on risk drivers, take immediate action to implement interim risk reduction measures. Increase frequency of levee monitoring, communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning systems and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions as very high priority.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very high risk.
High (2)		Based on risk drivers, implement interim risk reduction measures. Increase frequency of levee monitoring; communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions as high priority.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in high risk.
Moderate (3)		Based on risk drivers, implement interim risk reduction measures as appropriate. Verify risk information is current and implement routine monitoring program; assure operation and maintenance is up to date; communicate risk characteristics to the community in a timely manner; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions as a priority.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in moderate risk.

Risk Classification		Actions for Levee Systems and Leveed Areas in this Class (Adapt actions to specific levee system conditions.)	Risk Characteristics of this Class
Low (4)		Verify risk information is current and implement routine monitoring program and interim risk reduction measures if appropriate. Assure operation and maintenance is up to date; communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions to further reduce risk to as low as practicable.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in low risk.
Very Low (5)		Continue to implement routine levee monitoring program, including operation and maintenance, inspections, and monitoring of risk. Communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very low risk.
No Verdict		Not enough information is available to assign a Levee Safety Action Classification.	

(4) Coming out of a Levee Senior Oversight Group meeting, the following recommendations should be made:

(a) A recommendation will be made to accomplish the purpose of the risk assessment.

(b) A system will be put into a Levee Safety Action Classification.

(c) The group and the sponsor will agree on a prioritized list of recommendations.

(4) These items will be put into a memorandum and attached to the risk assessment results then transmitted to the Levee Safety Officer for USACE, the local USACE district, the division, and the sponsor.

c. Final risk assessment results.

(1) Agency and sponsor reviews.

(a) Risk assessments follow the USACE Civil Works Review Policy (https://www.usace.army.mil/Missions/Civil-Works/Review-Policy/).

(b) Sponsors are full participants in these reviews and contribute to resolving issues before the results of the risk assessment are briefed to the Levee Senior Oversight Group.

(2) Requests for reconsideration through the Levee Senior Oversight Group.

(a) Before any risk assessment is presented to the Levee Senior Oversight Group, the levee sponsor at any time can submit a letter of request through the appropriate district Commander to the Levee Senior Oversight Group proposing a different set of recommendations or overall conclusion. The letter should explain the rationale as to why the results should be changed and provide any additional information to support the change.

(b) The sponsor will also be given the opportunity to present this rationale to the Levee Senior Oversight Group. The Levee Senior Oversight Group will consider this information when it deliberates.

(3) Final documentation for screening risk assessments.

(a) To record and summarize each levee screening, a levee screening fact sheet initially generated in the Levee Screening Tool will be reviewed and verified by the district Levee Safety Program Manager within 30 days of receipt of the final decision memorandum from the Levee Senior Oversight Group.

(b) The final levee screening fact sheet will be provided to the levee sponsor as part of the comprehensive deliverable.

(4) Final documentation for semi-quantitative and quantitative risk assessments.

(a) Semi-quantitative and quantitative risk assessments will be summarized in a report. Final approval of each report will be by the district Levee Safety Officer and the Director of the Risk Management Center or the director's designee.

(b) A copy of the final report will be provided to each levee sponsor within 30 days of the report being finalized.

D-8. Where Can I Find More Information.

a. Reference information.

(1) Transition Guidance for Levee System Evaluations for the National Flood Insurance Program: https://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb/usace-ecb-2019-11

(2) USACE has a reference center that contains general information and links to documents and sites that contain more detailed information about risk assessments: https://www.rmc.usace.army.mil/ReferenceCenter/RiskAssessment

(3) USACE has a library of references that describe a variety of aspects of risk assessment: http://www.rmc.usace.army.mil/Library/RMC-Publications/

(4) The Risk Management Center has a list of tools that are used to assess risk: https://www.rmc.usace.army.mil/Software/

(5) EMA Products and Tools: https://www.fema.gov/flood-maps/products-tools

b. Available training.

(1) A variety of levee safety and risk assessment training is available from USACE: https://www.rmc.usace.army.mil/Training/Risk-Assessment/

(2) The U.S. Society on Dams has several courses that relate to risk assessments: https://ussdams.wildapricot.org/Workshops

(3) USACE, the Bureau of Reclamation, the Federal Energy Regulatory Commission, and the Tennessee Valley Authority jointly teach an advanced course in risk assessment – Best Practices in Dam and Levee Safety Risk Analysis: https://www.rmc.usace.army.mil/Training/Risk-Assessment/

Appendix E
Levee Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R)

E-1. Purpose. The purpose of this appendix is to provide an overview of how the U.S. Army Corps of Engineers (USACE) and levee sponsors will work together to track progress of and prioritize recommendations for the management of levees.

E-2. Managing Levees.

a. The continued success of federally authorized levees directing water away from people and property depends on those responsible for managing them. For many levees, this includes levee sponsors, who play a vital role ensuring the levee continues to remain in working order and taking actions to improve it.

b. Levee sponsors are responsible for managing levees consistent with the USACE issued operation and maintenance (O&M) manual and consistent with USACE and sponsor project agreements. This often includes routine activities like mowing the levee, completing inspections, testing or monitoring features on the levee, and rodent management, as well as non-routine activities, such as replacing or rehabilitating a portion of the levee.

c. Levee management should be continuous and informed by what is known about the levee. In some cases, the activities and options recommended to manage levees can be hard to prioritize because of the time and resources required.

d. Levee Safety Program activities and tools are intended to help levee sponsors have a stronger understanding of their levees and which actions have the greatest impact on their future performance. Levee inspections, for example, can help USACE and levee sponsors identify areas that are deteriorating and that need increased monitoring or action to address. However, risk assessments can often shed more light on how those areas could respond during a flood and whether addressing them really makes the most impact for the use of limited resources.

e. To help levee sponsors prioritize recommended actions on the levee, USACE will work with levee sponsors to develop a tool that summarizes best available levee information and recommended actions. This tool, referred to as the levee risk management summary, can be used to inform levee management actions and help USACE and levee sponsors monitor, track, and adapt planned levee operation, maintenance, repair, replacement and rehabilitation (OMRR&R) activities based on changing conditions.

E-3. Levee Risk Management Summary.

a. The levee risk management summary is an internal tool that details prioritized recommendations for OMRR&R for each levee system. It is based on best available levee information from formal and special inspections, site visits, and risk assessments and serves as the mechanism to:

(1) Consolidate newly collected information.

(2) Assess how the newly collected information in combination with other changed conditions may impact the risk to the leveed area.

(3) Develop, update, and adapt levee management recommendations.

b. Since the levee risk management summary is based on information gathered during Levee Safety Program activities, it is typically developed or updated in conjunction with them. USACE will lead development of the levee risk management summary with levee sponsors after each inspection and risk assessment, or when new information is collected or made available.

c. USACE will create and store the levee risk management summary in the National Levee Database. The levee risk management summary is available for sponsors but will not be publicly viewable.

d. While developing the levee risk management summary, USACE and levee sponsors will review the recommended actions together and discuss opportunities to implement them.

E-4. Managing Levees as Systems.

a. Levee systems are comprised of individual levees, or levee segments, often operated and maintained by a single entity. USACE and levee sponsors work together to ensure federally authorized levees continue to provide their intended benefits to communities. Doing so requires management of individual levee segments as well as the systems they comprise. A weak or low point in any part of a levee system can impact the levees' continued ability to keep water away from the leveed area.

b. Since levee segments operate as a system to reduce flood risks, it is important to consider recommendations that support continued success of the entire system. When making recommendations, USACE will consider how segments operate together and provide recommendations that optimize benefits for the entire system.

c. Summarizing the condition at the system level requires a synthesis of all segment (which may include non-project segments) information to determine what is most critical to continued performance. District Levee Safety Program Managers will lead development of the summary of recommended actions for the system working in partnership with levee sponsors.

d. Because all recommendations for a system will not be applicable to each individual

segment, district Levee Safety Program Managers will lead development of a levee risk management summary for each segment. Levees that are not a part of a system will have a single levee risk management summary specific to their levee. Levees that are part of a system (i.e. multiple levee segments often managed by different entities) will have a levee risk management summary specific to their levee that will include information and recommendations relevant to the system. This can provide sponsors for levee segments and systems actionable information and support understanding of how a segment contributes to the risk and success of the entire system.

e. In cases where a finding or recommendation relates to the system of levees, USACE will work with sponsors to coordinate and address them as a system.

f. While recommendations in the levee risk management summary will primarily relate to OMRR&R, others may be more relevant to actions in the area behind the levee. In cases where a recommendation extends beyond a levee sponsor's role or authority, USACE and the levee sponsor will work together to identify a more appropriate party to complete that recommendation and agree on a strategy to communicate it with them.

E-5. Prioritizing Recommended Actions for Levee Management.

a. Recommended actions for levee management are listed in priority order in the levee risk management summary. These recommendations are prioritized based on the what is most critical to the levee. For a multi-segment system, each segment will receive their own list of recommended actions. Some may be completed by one segment's sponsor; some may require coordination between multiple sponsors.

b. Recommended actions may involve obtaining a better understanding of the levee system by increasing how often levee inspections or risk assessments are conducted. They may also include sharing levee information with the community and improving evacuation planning and effectiveness.

c. Recommended actions often include activities to fulfill daily responsibilities. Some examples include routine culvert inspections, trial closure installations, and monitoring the levee toe during a flood event. Recommendations can include actions to reduce the likelihood and impacts of flooding which might involve structural repairs or modifications to the levee such as adding riprap or installing relief wells to reduce seepage.

d. Prioritizing and tracking levee management helps USACE and sponsors measure and assess progress in successful levee management over time. The initial levee risk management summary for a levee system will serve as the benchmark against which progress will be measured. Progress on each recommendation identified will be tracked until a recommendation has been marked complete or removed because the recommendation is no longer considered necessary.

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Appendix F
Sharing Levee Information

F-1. Purpose. The purpose of this appendix is to describe roles and responsibilities for sharing levee information to improve awareness and facilitate informed decision-making.

F-2. Why the U.S. Army Corps of Engineers Shares Levee Information.

a. Levees are designed to reduce the risk of flooding to people and property. While levees reduce the risk of flooding, they do not fully eliminate it. Raising awareness of levees, including the benefits they provide, actions being taken to maintain those benefits, known challenges or concerns with maintaining levees, and possible scenarios where the levee may not perform as designed and what could be affected, is a key element of the U.S. Army Corps of Engineers' (USACE) Levee Safety Program.

b. Sharing levee information is an iterative, open exchange of data, advice, and opinions among individuals, groups, and institutions about levees. For the Levee Safety Program, sharing levee information focuses on describing the benefits and flood risks associated with a levee and options to manage that risk. Typically, levee communication includes sharing information about the following topics:

(1) Why the levee is there.

(2) What is behind the levee.

(3) What/who benefits from the levee being there.

(4) How the levee works.

(5) The condition of the levee.

(6) How the levee will perform under a variety of circumstances.

(7) What/who might flood.

(8) How flood risk may change over time.

(9) Opportunities to preserve levee benefits.

(10) Options to manage flood risks.

c. Discussing the benefits and risks of levees can facilitate better awareness, understanding, and action both internally among peers and decision makers, and externally with other entities

such as other federal agencies, state or local governments, elected officials, or individuals. Intentionally engaging audiences in a dialogue to share information in the appropriate context and tone provides an opportunity to learn from, build trust with, and support others who play a vital role in addressing broader flood risk.

F-3. USACE's Goal for Sharing Levee Information.

a. The goal of sharing levee information is to build awareness of the benefits and risks associated with living and working behind a levee. Increased awareness can result in added support for and understanding of actions being taken to address areas of concern on the levee in addition to community and individual decisions to further protect people and property in the area behind the levee.

b. The USACE Levee Safety Program has information about levees that will be shared with those who operate and maintain the levee as well as those who benefit from the levee and who are potentially at risk. To build awareness, USACE will work in collaboration with other USACE communities of practice, sponsors for federally authorized levees, and federal, state, and local agency partners to:

(1) Maintain best available information about levees.

(2) Share information in a clear and simple manner.

(3) Provide access to and support understanding of available information, including how it can be used to inform actions on the levee, and actions by community leaders and decision makers to manage their flood risks.

(4) Develop a shared communication approach that identifies a lead, key information to share, audiences, ways to reach those audiences, and opportunities to adjust based on changes in risk, levee condition, or audience awareness.

(5) Partner to share levee condition and performance information with those who may need it, such as local emergency management agencies with responsibility for communication, evacuation, or local agencies responsible for land-use planning in the community.

(6) Publicly share baseline information about the Levee Safety Program and levees in the United States, to include where they are, what or who is behind them, their condition, the benefits they provide, and a characterization of their risks using tools such as the National Levee Database and Levee System Summaries.

F-4. Coordinating with Levee Sponsors and Getting on the Same Page.

a. Most federally authorized levees are operated and maintained by levee sponsors. Levee sponsors have varying roles and responsibilities unique to the agreements made when the project

was first authorized and constructed. Their involvement in all Levee Safety Program activities is essential since levee sponsors know the levee and the community that benefits from it best.

b. District Levee Safety Program Managers are responsible for developing and maintaining strong relationships with levee sponsors in their area. Doing so requires regular communication that includes discussions about the levee, check-ins on areas where the sponsor may need help, notice of planned or upcoming activities, and opportunities to engage in review of related materials.

c. Regularly checking in and being comfortable having frank discussions are key to a strong relationship and the basis for understanding and solving levee-related challenges together.

d. USACE will work with levee sponsors to ensure they are included in all Levee Safety Program activities. At a minimum, district Levee Safety Program Managers will work with levee sponsors to:

(1) Ensure they are aware of and invited to participate in all Levee Safety Program activities.

(2) Obtain, verify, and update information about levees.

(3) Provide access to information about their levee in the National Levee Database.

(4) Make clear which information will be publicly available on the National Levee Database and review that information together prior to sharing it.

(5) Discuss risk information about their levee and how it can be used.

(6) Agree to a strategy for sharing levee condition and performance information that aligns with authorities and responsibilities.

(7) Regularly coordinate, particularly for communication related activities.

(8) Share levee information with others (in a lead or support role depending on authorities and agreements).

e. USACE districts are required to develop a program management plan and ten-year outlook for Levee Safety Program activities. District Levee Safety Program Managers will coordinate with levee sponsors to develop the program management plan and include a planned frequency of activities for their levee and document their plans for being involved. For example, district Levee Safety Program Managers will be responsible for engaging levee sponsors in a discussion about the frequency of inspections for their levee and whether site visits may work well to check areas of the levee before the next formal inspection.

f. Districts will discuss all Levee Safety Program activities with levee sponsors and develop a shared understanding of their plans for being involved. Often limited involvement is due to resource or authority constraints. Districts will ensure that even when a sponsor cannot participate in all Levee Safety Program activities that they are aware of them, any impacts or findings relevant to the levee, and able to discuss findings in detail with USACE.

g. Having discussions with levee sponsors about Levee Safety Program information requires USACE to understand the results of activities and clearly communicate about them. When discussing levees and risk information, USACE will:

(1) Be specific – describe any issues with the levee plainly and identify which most relate to levee condition or performance.

(2) Make clear what the information means and how it can be used by levee sponsors or others when applicable.

(3) Recognize the varying entities involved that influence the risk of the levee and that often the levee sponsor role does not extend beyond the footprint of the levee.

(4) Summarize the benefits the levee provides along with the risks to provide context for the people or property that could be impacted in the case a levee breaches or overtops.

h. While many findings from Levee Safety Program activities can lead to recommendations more relevant to community leaders and decisions makers, such as the development of a community evacuation notice system, most are intended to help levee sponsors. USACE will work with levee sponsors to come to a shared understanding of what findings mean, what actions may be most impactful to address any levee-related issues, and how USACE can help.

i. USACE will work with levee sponsors to agree on an approach to communicate about this information with others. USACE is responsible for sharing levee information to raise awareness of their benefits and risks. Doing so in partnership with levee sponsors can improve the quality of the communication and its relevance to the people and property that benefit from levees.

j. For example, levee sponsors may have existing relationships with emergency management agencies in the community and can work directly with them to share levee condition and performance information that could inform emergency planning and preparedness activities. Levee sponsors can also work with USACE to make sure planned communication considers what is most important to the audience and any known local challenges, such as previous flooding that has left communities more concerned or limited resources within the community to act on the information being shared.

k. Depending on the specific authorities and agreements in place, USACE and levee sponsor roles for sharing levee information will vary. District Levee Safety Program Managers

will review the agreements in place for each levee within their area with levee sponsors and discuss who will lead sharing levee condition and performance information with others. USACE and levee sponsors will agree on an approach, document it in the district's program management plan, and develop communication plans and related materials consistent with this approach.

l. For levees without a levee sponsor or where USACE is responsible for operation and maintenance, the district is fully responsible for developing and implementing a strategy to share levee information with community leaders and decision makers.

m. Where USACE is designated to lead sharing levee information on behalf of a levee sponsor, USACE will ensure levee sponsors are provided the opportunity to be part of the development and delivery of levee communication. When publicly sharing levee information, USACE will ensure the levee sponsor is aware of and offered the opportunity to review the information being shared.

n. Regardless of who is designated to lead sharing levee information, USACE can serve as a technical advisor and is responsible for ensuring information about the levee is available, actionable, and clear. This may include being available to support levee sponsor communication by collaborating with sponsors to draft, review, test, and deliver communication, attending meetings, or developing resources to communicate about the levee.

F-5. Coordinating Internally with Other USACE Communities of Practice.

a. USACE's authorized responsibilities related to levees are broad. Information gathered by the Levee Safety Program is often used to support levee-related decisions and activities in other programs. As a result, it is important that Levee Safety Program data is available and up to date in the National Levee Database and accessible to other USACE programs when applicable. District Levee Safety Program Managers will ensure Levee Safety Program data and information is updated and available to internal partners.

b. Division and district Levee Safety Officers and Levee Safety Program Managers will also be responsible for working with division and district leadership to keep them updated on Levee Safety Program activities such as inspections, site visits, risk assessments, and communication. Doing so may identify opportunities for Levee Safety Program staff to collaborate with other USACE communities of practice on technical solutions or for communicating levee information externally.

c. When planning to share levee information externally, districts should look internally to see if there are existing relationships, teams, and activities that can be leveraged. For example, USACE emergency managers may have a recurring meeting with a community. Sharing levee condition and performance information during that meeting could help the community identify actions they can take to further safeguard people and property.

d. Leveraging existing relationships as well as skills and expertise can help USACE deliver levee information in a way that is useful to and actionable for the audiences who receive it. District Levee Safety Program Managers will engage staff with communication and partnership expertise within their district to assist with any effort to share levee information externally. For example, staff from public affairs can help translate technical information to be clear to anyone who reads it.

e. District Levee Safety Program Managers will document planned internal coordination and collaboration related to Levee Safety Program activities as part of their program management plan.

F-6. Coordinating Externally.

a. Other federal agencies have missions and responsibilities related to understanding, reducing, or communicating the impacts of flooding. Exchanging information with these agencies can extend the use of levee information and inform USACE and levee sponsor understanding of levees within the broader floodplain.

b. Where possible, USACE will engage other federal agencies to exchange flood risk information. Doing so may identify opportunities to develop partnered solutions or opportunities to share levee information to build public awareness of levees.

c. For example, the Federal Emergency Management Agency (FEMA) and USACE have shared goals of increasing public awareness related to flood risk. In areas with levee systems, USACE typically engages directly with levee sponsors and FEMA engages directly with community officials and levee sponsors. Coordinating these relationships can improve collective understanding of levees, actions to safeguard them, and options at the community level to further protect people and property.

d. District Levee Safety Program Managers are responsible for regular coordination with FEMA regional offices on program activities. Doing so can help FEMA and USACE accomplish the following:

(1) Identify levee-impacted areas where FEMA is actively engaging communities to update flood hazard analyses and National Flood Insurance Program maps.

(2) Identify risk and mitigation opportunities and levee accreditation data submittals to coordinate corresponding Levee Safety Program activities.

(3) Ensure alignment of messages and activities, including review of the National Levee Database, between FEMA and USACE to eliminate conflicts and minimize confusion.

(4) Seek to leverage opportunities with FEMA-led community meetings or other engagement activities.

e. District Levee Safety Program Managers will work with FEMA regional offices to develop consistent communication related to levees including with levee sponsors and communities. District Levee Safety Program Managers are the bridge between FEMA regional offices and levee sponsors and are responsible for sharing levee information with FEMA and ensuring sponsors are aware of what information is being shared.

f. This coordination can align district, levee sponsor, and FEMA communication to groups within the same area. District Levee Safety Program Managers are responsible for ensuring this coordination occurs and identifying additional federal partners with mission activities related to levees where additional coordination should occur.

F-7. Sharing Levee Information with Decision Makers in the Area Behind the Levee.

a. USACE and levee sponsors will work together to share levee information with others. Doing so can help decision makers in the area behind the levee understand the levee, actions being taken to safeguard it, and options available to further protect people and property.

b. Depending on the approach USACE and levee sponsors agreed to for communication, USACE or the levee sponsor may lead sharing levee information with others. District Levee Safety Program Managers will be responsible for documenting this approach in their program management plan and leading the development of a communication plan that provides USACE and levee sponsors a shared strategy for talking about levees.

c. Communication plans are intended to document the strategy for sharing levee information. They often summarize:

(1) What information will be shared.

(2) Who the information will be shared with.

(3) How information will be shared with identified audiences.

(4) Who will lead or support the strategy.

(5) How the strategy will be reviewed and updated as things change – such as community awareness, levee risks, or impacts to people and property.

d. Levee Safety Program communication plans will be:

(1) Drafted by USACE and coordinated with the levee sponsor and FEMA.

(2) Consistent with USACE and levee sponsor agreed upon roles and responsibilities for communicating about levees.

(3) Clear about who will be involved in reviewing and delivering planned communication.

(4) Provide baseline messaging and approaches for sharing information to support consistent communication about levees.

(5) Reviewed annually and updated as needed based on changes in messaging, awareness, and levee risk.

e. District Levee Safety Program Managers will lead the development of communication plans. In addition to documenting USACE and levee sponsor strategies for communicating about levees, communication plans should also be used to help districts communicate about the Levee Safety Program and related activities.

f. Where levee systems span multiple districts or divisions, Levee Safety Program Managers should coordinate to develop a shared approach. Districts can use the headquarters Levee Safety Program Communication Plan as an example when developing district-level plans.

g. While districts should use the USACE template for communication strategies, there is no requirement for levee sponsors to develop a communication plan nor to use the USACE template.

F-8. Communicating During a Crisis.

a. Crisis-related communication, or emergency communication, differs from risk and awareness building communication. It is directive, one-directional messaging that tells people they are at imminent risk and what they should do.

b. While crisis communication typically focuses on motivating people to take immediate actions during an emergency, it is best practice to develop a strategy before the event occurs. This includes considering the likely scenarios that could negatively impact people, developing a planned response to minimize those negative impacts, and establishing a strategy to notify communities or individuals so they can get out of harm's way.

c. For USACE operated and maintained levees, USACE will develop and include these communication and notification protocols as part of an emergency action plan consistent with current guidance (Engineer Circular 1110-2-6075: Inundation Maps and Emergency Action Plans and Incident Management for Dams and Levee Systems). The emergency action plan will detail evacuation activities, communication protocols with local emergency operations centers and the general public, individual roles and responsibilities during an emergency, and supplies and materials that may be needed.

d. USACE and levee sponsors have information that can help local emergency management agencies develop community-based emergency action plans. USACE and levee sponsors should coordinate where possible to ensure local plans account for hazards and scenarios identified

during risk assessments.

e. While crisis communication is inherently different due to its objective and approach, regular communication with those in the leveed area can elicit information helpful for planning crisis communication. For example, during regular communication USACE and levee sponsors may learn the community prefers to receive information from the mayor and that any communication during a crisis should be shared from that office.

f. It is best practice to incorporate crisis communication planning, as appropriate, into the overall communication effort. USACE districts may find it helpful to include emergency-related communication templates, plans, and messages as an appendix to the district communication plan.

F-9. Products and Communication Opportunities.

a. The following table (Table F-1) summarizes tools and opportunities for increased collaboration and coordination.

b. These tools may support both internal communication and getting on the same page about levee information, as well as co-lead efforts to share information externally.

Table F-1
Communication Tools and Opportunities

Tool	Main Uses	Frequency Developed/Updated
District program management plan	• Document planned activities and roles and responsibilities including for communication • Get on the same page within USACE, with levee sponsors, and with FEMA	• Initial draft to be completed by USACE • Reviewed periodically and updated as needed
Ten-year outlook of Levee Safety Program activities	• Develop an advanced schedule of levee safety activities that will inform internal and external communication activities • Plan for activities with levee sponsors and FEMA • Supports projected budget needs	• Initial draft to be completed by USACE with levee sponsors • Reviewed annually and updated as needed
Communication plan/strategy	• Documents a shared approach for communicating about levees and the Levee Safety Program • Typically includes how districts will talk about the program and key activities	• Initial draft to be completed by USACE • Depending on agreed upon roles, levee sponsors may help review or deliver messaging specific to their levees

Tool	Main Uses	Frequency Developed/Updated
	• Can include levee-specific messaging, strategies, and tactics • Best practice to include baseline messaging about levees that can be used by levee sponsors or FEMA	• Reviewed annually and updated as needed
Levee risk management summary	• Internal tool for USACE and levee sponsors that documents best available levee information • Developed using information from inspections and risk assessments • Typically includes recommended actions for levee sponsors as well as actions that others can take • Used to identify topics to communicate	• Initial draft to be completed by USACE with levee sponsors • Updated when there is new information (ex. following inspections, risk assessments, recent flood events, completing recommended actions, etc.)
Levee system summary	• Public summary of best available levee information • Tells the story of the levee including why it is there, the benefits it provides, the condition and typical performance, areas of concern, people and property who may be affected, and actions to address areas of concern • Can be used to share levee condition and performance information with decision makers in the area behind the levee	• Initial draft to be completed by USACE with levee sponsors • Updated when there is new information (ex. following inspections, risk assessments, recent flood events, etc.)
Levee Safety Program activities	• Activities such as inspections and risk assessments are opportunities to better understand a levee, improve relationships and coordination, and foster shared approaches to communication • Being on the same page about	• USACE will discuss frequency of these activities with the levee sponsor as part of developing the program management plan and ten-year outlook • District Levee Safety Program Managers will regularly check in with levee sponsors to let

Tool	Main Uses	Frequency Developed/Updated
	the levee makes it easier to talk to others about it and actions they can take to address components of risk that are not in USACE or the levee sponsor's control	them know about upcoming activities, review what is involved (for example, the steps of a risk assessment and key opportunities to collaborate), confirm availability, discuss results and planned actions, identify where help is needed, and seek feedback for how to be better partners
National Levee Database	• Publicly available inventory of levees in the United States • Raise public awareness of levees • Summarize where levees are, their physical attributes/features, what is behind them and potentially affected should the levee fail, inspection information and risk assessment information when available, and National Flood Insurance Program and Public Law 84-99 Rehabilitation Program status	• USACE maintains available data • FEMA updates data relevant to the National Flood Insurance Program • USACE reviews and updates the National Levee Database following inspections and risk assessments • USACE notifies and reviews updates with levee sponsors as they are made
USACE regional meetings	• USACE districts frequently host regional or district specific meetings about flood risk management and levees • Meetings are intended to share information, coordinate on ongoing activities, and partner • Meetings can support cross-community of practice coordination • When possible, districts should include levee sponsors	• Scheduled by USACE division and district offices • Opportunities to participate can be identified in advance in the program management plan, ten-year outlook, or communication plan

Tool	Main Uses	Frequency Developed/Updated
Levee district/board meetings	• USACE is available to attend meetings the levee sponsor has with its leadership and staff • Engaging in sponsor-led conversations about the levee can help USACE better understand levee sponsor challenges	• As requested by the levee sponsor • Opportunities can be identified in advance in the program management plan, ten-year outlook, or communication plan
FEMA regional meetings	• USACE is available to attend FEMA regional meetings to coordinate on ongoing activities and communication	• As requested by FEMA • Opportunities can be identified in advance in the program management plan, ten-year outlook, or communication plan

Appendix G
Inventory of Levees

G-1. Purpose. The purpose of this appendix is to describe how the National Levee Database is used and how the levee information in the database is managed and maintained.

G-2. An Inventory of Levees: The National Levee Database.

a. The U.S. Army Corps of Engineers (USACE) established the National Levee Database to manage an inventory of all known levees in the United States. The inventory is intended to promote public awareness of levees and to support those responsible for levees with a consistent set of information to inform their activities.

b. Levees in the United States are owned, operated, regulated, or maintained by a variety of entities including federal agencies, states, municipalities, levee boards, and private groups. USACE partners with these groups to gather, improve, store, and display information about levees through the National Levee Database.

c. The current amount and detail of information for levees in the National Levee Database varies, but generally includes:

(1) The location of the levee.

(2) A summary of its general condition.

(3) An estimate of the number of people and structures within the area behind the levee.

d. In addition to making this information available to the public and those responsible for levees, USACE also uses the National Levee Database to support its levee-related activities. For example, USACE stores information related to inspections and risk assessments in the National Levee Database. Doing so allows USACE and those responsible for levees to have a single shared access point to all information relevant to a levee.

e. The National Levee Database includes information about levee segments and summary information for levee systems. Often, federally authorized levees operated and maintained by USACE and levee sponsors include additional information that summarizes:

(1) The benefits the levee provides.

(2) Known areas of concern or maintenance challenges.

(3) Potential impacts to people and property should the levee breach or overtop.

(4) Planned and ongoing work to ensure the levee continues to provide its intended benefits.

f. This information is publicly shared to increase awareness of levees and actions being taken to safeguard the structure and inform community and individual actions that further protect the things they value. Since this information is publicly shared, it is critical for USACE and levee sponsors to work together when determining what information is shared.

G-3. Accessing Information in the National Levee Database.

a. Anyone can view summary data and statistics that characterize levees throughout the country in the National Levee Database. For example, the site provides statistics on the number of levees in the U.S., the miles of levees, the average levee age, and how many levees are within USACE's responsibility.

b. A subset of data and information is also publicly available in the National Levee Database for any levee. Each levee segment and system have a dedicated page that provides information on the levee and its features. For example, a page for a levee system lists all levee segments that comprise the system, links to publicly available documents like the levee system summary, summarizes the levee's most recent inspection, and lists whether the levee is accredited in the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program. Site visitors can see a map that represents the levee and its alignment. When available, the page will include information that summarizes the most recently completed risk assessment.

c. More detailed information about levees is available to other site users such as federal agencies, state, regional, tribal, and local governmental employees, and entities responsible for operating and maintaining levees. Typically, this information includes:

(1) Inspection reports.

(2) Site visit summaries.

(3) Reports summarizing any completed risk assessments.

(4) Levee performance data collected during emergency flood operation.

(5) Documentation related to levee operation and maintenance.

(6) Any other resource relevant to the levee and entity responsible for operating and maintaining it.

d. Login credentials are required to access this information.

e. Entities responsible for a given levee will have access to all the information available for

their levee. For example, levee sponsors for federally authorized levees will be given login credentials and will be able to view documentation related to their levee. However, a levee sponsor or site user cannot view this detailed information for levees that they aren't responsible for.

f. District Levee Safety Program Managers will be responsible for ensuring levee sponsors have login credentials to view information for their levee. Levee sponsors can also submit a request for login credentials to the National Levee Database help desk (DLL-CEERD-NLD-GENERAL-SUPPORT@USACE.ARMY.MIL) who will coordinate with the district Levee Safety Program Manager.

g. Detailed information from an inspection or risk assessment is intended to support levee sponsors' activities on the levee. This detailed information is not publicly available. USACE and levee sponsors will work together to ensure the information available in the National Levee Database is up to date, including information only accessible when logging into the database and information available for the public to see. USACE and levee sponsors will ensure sensitive information such as the location of a specific issue on the levee is only available for the appropriate users.

h. All USACE employees can request credentials to log into the National Levee Database and access project specific levee data. However, not all USACE users can make changes to data or information available. For example, an employee with editing access to the National Levee Database in one USACE district cannot edit detailed information for a levee in another district without the appropriate access rights. Edit capability is assigned by district. Requests for rights to edit or add data must be submitted to the district Levee Safety Program Manager. For example, staff responsible for completing levee inspections require additional access rights to document inspections and should coordinate with the district Levee Safety Program Manager to obtain the appropriate rights.

i. Individuals external to USACE and associated with a governmental organization can be given access to more detailed levee information relevant to their role or authority. Typically, federal agency employees with login credentials can view information for all levees in the National Levee Database. In some cases, federal agencies may have editing rights. For example, FEMA maintains information about levee accreditation and is responsible for updating related data in the National Levee Database.

G-4. Responsibilities for Updating and Maintaining Information in the National Levee Database.

a. USACE is responsible for maintaining the National Levee Database. A program manager is assigned to oversee maintenance, enhancements, access, and daily use of the site. Often, this includes supporting USACE district staff responsible for loading data to the National Levee Database. For example, the National Levee Database program manager would work to address issues with the site appropriately displaying information or its connectivity to other tools

such as the Levee Inspection System, which is used to complete USACE inspections and is directly linked to the National Levee Database to more easily share results with levee sponsors.

b. USACE districts are the primary editors for levee-specific data in the National Levee Database. Districts are responsible for populating or updating data within the National Levee Database. This can include working to add a new levee and related information to the National Levee Database or loading new data for levees that already exist in the National Levee Database.

c. Districts typically review and update information in the National Levee Database when completing Levee Safety Program activities. For example, after completing an inspection using the Levee Inspection System, the district team would ensure information gathered is loaded and correct in the National Levee Database. The district would use the newly populated information to develop a report that summarizes findings and observations during the inspection.

d. Districts would similarly update and check data in the National Levee Database related to risk assessments. For example, a screening risk assessment is completed using a web-based tool called the Levee Screening Tool. The tool is connected to the National Levee Database. Once a screening is complete, risk assessment data can be displayed in the National Levee Database and used to produce an initial summary of results and recommendations.

e. Districts are responsible for ensuring files and resources associated with Levee Safety Program activities are available, correct, and reviewed and shared with the levee sponsor. Districts should plan to discuss findings after inspections, site visits, or risk assessments with the levee sponsor. When doing so, the district and levee sponsor will review where data from those activities can be found in the National Levee Database and how they can be used. Districts will also coordinate with the levee sponsor any time data for their levee is being changed. Doing so allows USACE and levee sponsors to correct any errors and ensure the edits are accurate.

f. Levee sponsors are not responsible for editing data for their levee in the National Levee Database. However, levee sponsors are encouraged to review data in the National Levee Database, notify USACE when any errors are found, and work with USACE to ensure errors are corrected.

g. Levee sponsors also have the option to use the National Levee Database to keep files and information for the levee. For example, summaries from levee sponsor completed inspections can be helpful resource for both the sponsor and USACE to inform priorities and activities to maintain the levee. Sponsor inspections can provide timely information between formal USACE inspections that help USACE and sponsors have a more accurate pulse on the state and condition of the levee. This information can be used to adjust planned or ongoing activities, or to inform future USACE inspections and risk assessments. USACE can upload these files to the National Levee Database on the levee sponsor's behalf.

h. It is important to note that FEMA is responsible for maintaining National Levee Database data related to the National Flood Insurance Program. USACE will regularly review any updates to data from FEMA, particularly when the data relates to the status of a levee's accreditation. USACE district Levee Safety Program Mangers will ensure levee sponsors are aware of any changes to this data.

G-5. How the National Levee Database is Used.

a. The National Levee Database is used to publicly share information about levees. Sharing levee information can help build understanding of:

(1) What a levee is.

(2) What a levee does.

(3) What benefits levees provide.

(4) What is required to keep levees in good working order.

(5) Who manages levees.

(6) What condition levees are in.

(7) What congressional district levees are in.

(8) What can be done to improve the state of levees in the United States.

(9) What the potential impacts to people and property are in the case that a levee fails.

b. Increased understanding of levees can bolster support for them, foster recognition of the valuable role they play within a community, and highlight opportunities for community leaders and individuals to take actions that can further protect the things they value.

c. Publicly available information in the National Levee Database can also be used by levee sponsors to work within their community to build understanding of what is being done to make sure the levee continues to provide its intended benefits. This information can also be used by levee sponsors to communicate levee condition and performance information with those who may need it.

d. Information in the National Levee Database can support regional, local, and community planning and activities related to levees and flooding. For example, a community may decide they need to update local evacuation plans in the event of major flooding. Information about the levee within that community could inform the approach the community takes to notify people

near the levee if or when they need to evacuate.

e. The National Levee Database is also used to support Levee Safety Program activities. For example, districts use the National Levee Database to store important documents about a levee and update relevant fields when inspections or risk assessments are completed. The National Levee Database is also linked to tools such as the Levee Inspection System and Levee Screening Tool. Linking these resources helps USACE more easily share results and recommended actions to inform levee management activities.

f. Sharing these technical resources in one location provides USACE and sponsors for federally authorized levees a common point for information. Access to the same and most recent information about a levee can help USACE and levee sponsors prioritize actions on the levee, track progress over time, and monitor how changing levee conditions or flood hazards affect levee performance over time.

g. USACE also uses the National Levee Database to monitor implementation of the program. Districts must update information in the National Levee Database as activities are completed and ensure appropriate coordination occurs with levee sponsors. USACE headquarters is responsible for monitoring districts, identifying challenges that are keeping districts from being successful, and implementing changes so that information collected through the program is accessible to those who need it in a timely and usable fashion.

Appendix H
Key Facts: Levee Safety Program and Public Law 84-99 Rehabilitation Program

A screenshot of the fact sheet, Key Facts: Levee Safety Program and Public Law 84-99 Rehabilitation Program, follows and is available on the USACE Levee Safety Program website: https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll11/id/4638.

U.S. ARMY CORPS OF ENGINEERS

KEY FACTS: LEVEE SAFETY PROGRAM & PL 84-99 REHABILITATION PROGRAM

How the Levee Safety Program & Public Law 84-99 Rehabilitation Program Work Together Today

The Levee Safety Program inspects levees at least once every 5 years using a standard checklist to monitor levee condition and identify specific items to be fixed during routine maintenance, and shares this information with the PL 84-99 Rehabilitation Program.

Levees that meet specific criteria are eligible through the PL 84-99 Rehabilitation Program for federally funded levee repairs after a flood event. USACE determines if a levee is eligible for the PL 84-99 Rehabilitation Program using a subset of the items evaluated during a Levee Safety Program inspection. These items must receive acceptable or minimally acceptable ratings for the levee to be eligible for the PL 84-99 Rehabilitation Program.

Continuing eligibility for the PL 84-99 Rehabilitation Program will be reviewed any time a Levee Safety Program inspection is completed. Levee sponsors can request a levee be inspected sooner than the normally scheduled inspection.

INSPECTION CHECKLIST	18 ITEMS USED BY THE PL 84-99 REHABILITATION PROGRAM
LEVEE EMBANKMENTS	1 Encroachments 2 Closure structures 3 Slope stability 4 Erosion/bank caving 5 Animal control 6 Culverts/discharge pipes 7 Underseepage relief wells/ toe drainage systems
FLOODWALLS	8 Encroachments 9 Closure structures 10 Tilting, sliding, settlement of concrete structures 11 Foundation of concrete structures 12 Underseepage relief wells/ toe drainage systems
INTERIOR DRAINAGE	13 Culverts/discharge pipes 14 Sluice/slide gates 15 Flap gates/ flap valves/ pinch valves
PUMP STATIONS	16 Intake and discharge pipelines 17 Sluice/slide gates 18 Flap gates/ flap valves/ pinch valves
CHANNELS	Levees only receive a rating for the items they have. Each item can receive a rating of acceptable, minimally acceptable, or unacceptable.

What if I receive an unacceptable rating for one of the inspection items used by PL 84-99 Rehabilitation Program?

Levee sponsors can remain temporarily eligible for the PL 84-99 Rehabilitation Program while addressing issues with their levee. Levee sponsors will be required to develop a plan to address issues with their levee and demonstrate progress to remain eligible for the PL 84-99 Rehabilitation Program. Levee sponsors should contact their local USACE District for more information on the system-wide improvement framework (SWIF) process.

Proposed Future Changes to the PL 84-99 Rehabilitation Program Eligibility Criteria

USACE plans to change the criteria used to determine a levee's continued eligibility in the PL 84-99 Rehabilitation Program. The proposed criteria would assess preparedness activities specific to the levee's performance during a flood event. **No change will be made to eligibility criteria without going through the rulemaking and public input process.**

What does this mean for my levee's eligibility?

Currently, the only information used to determine a levee's continued eligibility in the PL 84-99 Rehabilitation Program is a subset of items in the levee inspection checklist that relate to how a levee is maintained. The future criteria are proposed to be able to account, not only for how a levee is maintained, but how it has performed in the past. This allows sponsors to take credit for their hard work in flood fighting and improving levee performance.

USACE is not working toward eligibility criteria that are out of the control of the sponsor, such as potential consequences in a leveed area.

PROPOSED ELIGIBILITY CRITERIA

OPERATION, MAINTENANCE, INSPECTIONS
Assesses how well levee sponsors address operation and maintenance and monitoring activities that can most affect levee performance, addressing the most critical items first.

LEVEE SPONSOR EMERGENCY PREPAREDNESS
Assesses pre-planned activities outlining roles and responsibilities implemented during a flood event, such as identifying stockpile of necessary supplies and equipment to operate.

SHARING INFORMATION
Assesses how levee sponsors have shared information related to the performance and operation of their levee with community leaders and emergency managers.

PARTICIPATION IN LEVEE SAFETY PROGRAM ACTIVITIES
Assesses levee sponsor participation in activities, such as risk assessments and formal inspections, and promotes developing stronger relationships between levee sponsors and USACE to encourage dialogue and problem solving.

Glossary

Benefits (attributed to a levee system)
A qualitative or quantitative description of the positive contributions the levee system has or can provide to the community in the leveed area. This can include: reduction in potential flood damages to residential structures and businesses; potential for the reduction of loss of life; prevention of damages to community services such as schools, hospitals, water treatment plants and other municipal services; prevention of damages to roadways; and providing critical time for the population to get out of harm's way during a flood event.

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

Community
Any state or area or political subdivision thereof, or any Indian tribe or authorized tribal organization, or Alaska Native village, or authorized native organization that has the authority to adopt and enforce regulations for the areas within its jurisdiction.

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

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

Deliverable
A compilation of products used to relay comprehensive results and recommendations for a levee system.

Economic risk
The measure of the probability (or likelihood) of direct and indirect economic losses within a leveed area.

Emergency action plan
A formal document that identifies potential emergency conditions at a levee and specifies pre-planned actions to be followed to reduce consequences of the emergency.

Environmental risk
Risk associated with the likelihood of direct and indirect impacts on environmental, cultural, and historic resources within the leveed area that cannot be measured in monetary terms.

Federally authorized and USACE operated or maintained levees
Congressionally authorized levees that USACE has full or partial responsibility to operate or maintain as well as to rehabilitate and modify, as appropriate, under existing authorities.

Federally authorized and locally operated and maintained
Congressionally authorized levees that are operated and maintained by a local public sponsor through a project agreement with USACE. This category includes levees constructed by USACE and those constructed by others and federally authorized.

Flood
An overflow of water that submerges land which is normally dry.

Flood risk (or residual risk)
The risk of flooding in a leveed area that remains at any point in time after accounting for the flood risk reduction contributed by the levee system.

Formal inspection
A pre-scheduled comprehensive levee inspection by a team of subject matter experts led by a professional engineer or professional geologist to: document the condition of a levee; inform levee management activities; include specific considerations, such as testing gates; and serve as a primary source of information related to levee condition and performance for risk assessments. Inspections verify any changed conditions and may capture progress of levee management measures for consideration in subsequent inspections or risk assessments.

Hazard
An event that causes the potential for an adverse consequence.

Incident
An event occurring at a levee system that could potentially result in a levee safety issue.

Inconclusive finding
A conclusion that there is insufficient information to determine whether or not a specific criterion of 44 Code of Federal Regulations (CFR) 65.10 for the National Flood Insurance Program has been met as a result of a screening risk assessment or levee inspection.

Interim risk reduction measure
An action to reduce levee risk while more long-term and comprehensive risk reduction and management solutions are being pursued.

Inundation
In the context of this document, this refers to flooding in a leveed area.

Inundation scenario (for a levee system)
A scenario which could result in flooding in a leveed area. The four inundation scenarios for a levee system are: breach prior to overtopping; overtopping with breach; component malfunction/mis-operation; and overtopping without breach.

Levee
A man-made barrier along a watercourse with the principle function of excluding flood waters from a limited range of flood events from a portion of the floodplain (referred to as "leveed area").

Levee accreditation
The process in which a levee system is evaluated to determine how it will be mapped by the Federal Emergency Management Agency for the purposes of the National Flood Insurance Program.

Leveed area
The lands from which flood water is excluded by the levee system.

Levee feature
A structure that is critical to the functioning of a levee system. Examples include embankments, floodwalls, pipes and associated drainage features, closures, pumping stations, floodways, and designed channels.

Levee Inspection System
The electronic tool used by USACE to document levee inspections.

Levee risk (or incremental risk)
The risk of inundation posed by a levee system for the following three inundation scenarios: prior to overtopping; overtopping with breach; and component malfunction/mis-operation.

Levee risk management summary
An internal tool that details prioritized recommendations for operation, maintenance, repair, replacement, and rehabilitation for each levee system based on best available information related to risk assessments, levee inspections, and past performance.

Levee safety
The art, science, and practice of managing flood risks posed by levee systems.

Levee Safety Officer
Person selected by appointment to serve as the lead for levee safety issues, recommendations, and decisions at a particular level in USACE.

Levee Safety Program Manager
Person selected by appointment to lead the coordination and implementation of the USACE Levee Safety Program at a particular level in USACE.

Levee Screening Tool
The electronic tool used by USACE to complete all screening risk assessments.

Levee Senior Oversight Group
Consists of USACE staff representing key disciplines in levee safety and provides recommendations to the USACE headquarters Levee Safety Officer and deputy Levee Safety Officer on levee risk characterizations; prioritization of levee federal investments; direction for levee projects with high potential life safety risk; and other levee safety matters.

Levee segment
A levee segment is a discrete portion of a levee system that is operated and maintained by a single entity. A levee segment may be composed of one or more levee features.

Levee sponsor
A public entity that has responsibility for operation and maintenance for all or a certain portion of a levee system. Within this document, levee sponsor refers to entities who operate and maintain federally authorized levees through a project agreement with USACE.

Levee system (or levee)
Composed of one or more levee segments and other features that are collectively integral to excluding flood water from the leveed area. The term "levee segment" is used to identify a discrete portion of a levee system that is operated and maintained by a single levee sponsor.

Levee system summary
Public summary of best available levee information that tells the story of the levee including why it is there, the benefits it provides, the condition and typical performance, areas of concern, people and property who may be affected, and actions to address areas of concern.

Life safety risk
A measure of the probability and severity of loss of life resulting from inundation of a leveed area.

Likelihood (or probability)
A measure of the chance, or degree of belief that a particular outcome will occur. A probability provides a quantitative description of the likelihood of occurrence of a particular event. Probability is expressed as a value between 0 (impossible) and 1 (certain). Likelihood can be expressed qualitatively as well (e.g., high, medium, or low).

Mitigation
Actions taken that reduce potential loss of life and property by lessening the impacts of flood.

National cadre
An independent multi-disciplinary team trained and approved by the Risk Management Center to provide independent perspective and reviews of risk assessments.

National Flood Insurance Program
Administered by the Federal Emergency Management Agency, the National Flood Insurance Program is a voluntary program authorized by Congress to mitigate flood losses through community-enforced building and zoning ordinances and to provide property owners with access to federally-backed flood insurance. As part of the National Flood Insurance Program, the Federal Emergency Management Agency issues Flood Insurance Rate Maps that depict flood hazards and are used by local communities for the purposes of determining flood insurance and floodplain management requirements. The National Flood Insurance Program requires federally regulated lending institutions to ensure that mortgage loans secured for buildings in high flood hazard areas, referred to as Special Flood Hazard Areas, are covered by flood insurance.

National Levee Database
A congressionally authorized database that contains information on levees in the United States.

Negative finding
A conclusion that there is sufficient information to determine that a specific criterion of 44 Code of Federal Regulations (CFR) 65.10 for the National Flood Insurance Program has not been met as a result of a screening risk assessment or levee inspection.

No verdict
An inspection rating and Levee Safety Action Classification assignment given when no access has been obtained to perform an inspection.

Non-breach risk
The risk associated with the scenario when the still-water level and/or associated waves, wind runup, or surge exceeds the top of the levee system, but does not result in a breach of the levee system.

Non-federally authorized and locally operated and maintained levee
Levee that is locally constructed, operated, and maintained.

Non-project segment
A segment of man-made high ground which a levee system/segment ties into and whose existence and performance is necessary for excluding flood waters from the leveed area. Some examples of these are roadways, railroads, canals, and other levee embankments. Non-project segments are inventoried, inspected, and assessed if they make up part of the levee alignment and are necessary for the proper functioning of the levee system.

Overtopping
A condition that occurs when the elevation of the still-water level and/or associated waves, wind runup, or surge exceeds the top of the levee system. This may or may not result in a breach of the levee system.

Performance
How the levee system has functioned or is anticipated to function during specified hazards.

Positive finding
A conclusion that there is sufficient information to determine that a specific criterion of 44 Code of Federal Regulations (CFR) 65.10 for the National Flood Insurance Program has been met as a result of a screening risk assessment or levee inspection.

Potential failure mode
A structured way to describe a chain of events that leads to a levee breach.

Preparedness
Actions taken before a possible future flood event, including planning, training, communication, and anticipation of how the levee will perform based on operation and maintenance, inspections, and assessments.

Program management plan
A formal, approved, living document used to define program requirements and expectations, accountability and performance measures, and guidance program execution. These documents can include a ten-year outlook of program activities as well as a strategy for sharing levee information that corresponds with USACE Levee Safety Program activities.

Project agreement (project cooperation or project partnership agreement)
Legally binding agreement between the government and a non-federal sponsor (state, municipal government, flood control district, port authority, etc.) for construction or operation and maintenance of a water resources project. It describes the project and the responsibilities of the government and the non-federal sponsor.

Quantitative risk assessment
Uses currently available information but may also involve gathering new information to inform its findings, considers custom failure modes specific to the levee, and results in calculated numeric estimates of risk.

Recovery
Actions taken after a flood, including those directed toward a return to normalcy.

Response
Actions taken during a flood, including those to save lives and prevent damage.

Resilience
The ability to avoid, minimize, withstand, and recover from the effects of adversity, whether natural or man-made, under all circumstances of use.

Risk
The measure of the probability (or likelihood) and consequence of uncertain future events.

Risk assessment
A systematic, evidence-based approach for quantifying and describing the nature, likelihood, and magnitude of risk. Risk assessments are a tool to determine the most likely ways a levee might breach or overtop, how likely those scenarios are to occur, and the potential impacts within a community.

Risk cadre
A multidisciplinary team of experts trained in conducting risk assessments.

Risk characterization
Description of the levee system in the context of risk by considering the key drivers of likelihood of performance, potential consequences, and sources of uncertainty.

Risk communication
An iterative, open exchange of data, advice, and opinions among individuals, groups, and institutions about levees, the benefits they provide, known risks or areas of concern, and options available to manage that risk.

Risk estimate
The combination of the probability of inundation of the leveed area and the associated consequences typically portrayed in a risk matrix.

Risk management
The process of problem finding and initiating action to identify, evaluate, select, implement, monitor, and modify associated risks.

Screening risk assessment (or levee screening)
A simplified risk assessment that relies on existing data, historical performance, engineering judgment, and assumes pre-defined performance modes to quickly characterize levee risk.

Semi-quantitative risk assessment
A risk assessment that uses a combination of limited numerical estimates with qualitative descriptions that result in risk estimates based on orders of magnitude.

Sensitive information
Information that could pose a security risk or aid those intending to do harm to a levee system.

Site visit
A collaborative activity to observe or verify any changed conditions, provide technical advice and respond to sponsor's questions, or capture progress of levee management measures for consideration in the next inspection or risk assessment.

Special inspection
Unscheduled inspections conducted as needed due to changed conditions or to document performance.

Stakeholder(s)
An individual or group of individuals who are responsible, interested, and/or affected by a levee system. An individual stakeholder may belong to more than one group of stakeholders.

Uncertainty
The deficiency or unsureness in information related to the understanding or knowledge of the risk or components of risk.