FEMA

Fact Sheet

FEMA Dam Safety Series
Fact Sheet 5: Benefits of Post-Event Data Collection for Dams **June 2018**

BACKGROUND

Data collected from dams after disasters can be used to evaluate the effectiveness of design and construction techniques; provide valuable insight into dam performance during flood conditions; and provide useful information for improving preparedness, mitigation, response, or recovery actions pertaining to the dams.

Emergency managers are also increasingly using data analysis, visualization, and reporting for measuring the effectiveness of mitigation and response/recovery efforts, thereby combining defensible analysis and methods with clear metrics to guide future pre-event preparedness measures.

Purpose and Intended Audience

This Fact Sheet shares examples of data collected for dams after Hurricane Matthew in 2016 to help stakeholders better understand some of the potential benefits of post-event data collection at dams.

The intended target audience for this Fact Sheet includes federal, state, territory, and local officials; tribal leaders; county and city engineers, planners, and emergency managers; dam owners and operators; building and property owners near or potentially affected by a dam failure; and other interested stakeholders.

DATA COLLECTION

Dam breach data collected after a storm event can be used to evaluate the effectiveness of the design and construction techniques and to help improve understanding of the dam's performance during flood conditions.

Breached dams, especially, should undergo detailed inspections to identify damage and areas of potential deficiencies. For more information, refer to the Training Aids for Dam Safety (TADS) module on dam safety inspection (FEMA, 2007).

The best time to collect data is immediately after the event, if possible, before repairs have begun or weather degradation occurs.

Examples of Actions Taken

After Hurricane Matthew, breached dams were inspected by state dam regulators, dam owners and operators, and their engineers and engineering consultants, or were assessed by various dam safety professionals. Data were collected during in-person inspections and assessments and documented with inspection and assessment reports and photographs. The types of data collected included the dimensions of the breach, high water marks in the inundated areas, and the elevation of the reservoir. In addition, visual inspections were conducted to determine the state of slopes and slope protection, vegetation on the dam, animal activity, erosion and seepage, debris blockage at gates, and appurtenant structures.

In the case of dams that were damaged by Hurricane Matthew, data were collected during the weeks immediately following the disaster until up to a year after the event. Perishable data should be collected as soon as possible after an event occurs or the risk increases of that data no longer being available. Data might be lost as a result of changes and repairs made at the dam(s), ensuing weather events, inflows, or other causes that result in degradation of the original damaged site(s). Improved understanding of what occurred and why can help in future design, construction, or regulation to reduce vulnerabilities, improve resilience, or mitigate as needed to adequately address the anticipated hazard(s) and reduce future risk.

BENEFITS OF POST-EVENT DATA COLLECTION FOR DAMS

Post-event data collection provides additional insight to the dam's design, condition, performance, and effects on downstream assets by:

- Verifying inundation models Updating/refining dam breach parameters
- Comparing observed width and depth of breaches to equation-based estimates
- Evaluating failure mode(s)
- Refining failure/breach analyses for developing Emergency Action Plan inundation mapping
- Obtaining water depths at the inundated areas of failed dams
- Using lessons learned to prepare for the next event
- Obtaining high water marks to help determine water surface elevations at the upstream and downstream faces or left and right abutments of breached or overtopped dams

Post-event data are especially critical for risk assessment. To be better prepared for a dam safety incident, stakeholders can improve their understanding of potential consequences of an incident, including an unplanned large reservoir storage release or failure scenario for a particular dam and the probability for a given event scenario (e.g., mechanical failure; inoperative gate or valve; trash rack or inlet clogging) at that specific dam. With this information, dam owners can develop dam-specific plans and establish memorandums of agreement so they are better prepared to respond to emergency incidents. In addition, communities can include this information in mitigation plans, land use plans, a dam-specific annex to their Emergency Operations Plan, or other documents as needed.

Dam regulators, owners, or stakeholders can also get an improved understanding of the inflows/outflows or flood events that caused failures or overtoppings to help determine hydrologic trends over time, risks, and vulnerabilities as well as to help determine adequacy of regulations, guidance, and operations.

REFERENCES AND RESOURCES

References

FEMA. 2007. *Training Aids for Dam Safety (TADS): A Self-Instructional Study Course in Dam Safety Practices.* https://www.fema.gov/media-library/assets/documents/13602

Resources

FEMA. 2017. *Hurricane Matthew in North Carolina Dam Risk Management Assessment Report.* FEMA P-1090. https://www.fema.gov/media-library/assets/documents/131866

FEMA. 2013. *Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures.* FEMA P-946. https://www.fema.gov/media-library-data/96171edb98e3f51ff9684a8d1f034d97/Dam_ Guidance_508.pdf

Useful Websites

North Carolina Dam Safety Program: https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permits/dam-safety

South Carolina Dam Safety Program: http://www.scdhec.gov/Environment/WaterQuality/DamsReservoirs/DamsOverview

North Carolina Department of Public Safety, Emergency Management: https://www.ncdps.gov/our-organization/emergency-management

South Carolina Emergency Management Division: http://www.scemd.org South Carolina Hurricane Matthew-Related Updates on Dams: http://www.scdhec.gov/HomeAndEnvironment/DisasterPreparedness/FloodUpdates/MatthewDamBreaches

South Carolina Records on Breached Dams: http://www.scdhec.gov/HomeAndEnvironment/DisasterPreparedness/FloodUpdates/FailedDamReports

Other Fact Sheets in this Dam Safety Series

Fact Sheet 1: Use of Emerging Technologies

Fact Sheet 2: Notification Methods

Fact Sheet 3: Benefits of Pre-Event Exercises and Training

Fact Sheet 4: Proactive Actions

The National Dam Safety Program is a partnership of the states, federal agencies, and other stakeholders that encourages and promotes the establishment and maintenance of effective federal and state dam safety programs to reduce the risks to human life, property, and the environment from dam-related hazards.

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