

ISSUE BRIEF



KENTUCKY DAMS

2011 Kentucky Grade: D+

Date: February 1, 2011

Dams are a critical part of Kentucky's infrastructure both in terms of benefits and associated risks to human life, and other infrastructure located downstream. Many dams in the state are approaching or exceeding their intended design life. As these dams continue to age they will require continued inspection in order to function as intended. Without this attention, dams are at risk of falling into disrepair, increasing the risk of future failures. Recent dam failures across the nation highlight the importance of maintaining dams as part of the infrastructure.

CURRENT CONDITIONS

Kentucky's dams were last evaluated by the ASCE Kentucky Section in 2003. At that time, a grade of C- was given due to the additional funding that was required to address dam repair needs in a timely manner. The funding also addressed the need for training programs for the owners of dams, the regulatory officials and the general public. Over the past seven years little or no progress has been made and, therefore, the grade is now D+.

Dams meet a variety of life-sustaining needs. The purpose of a dam is to impound water, wastewater or liquid-borne materials for a variety of reasons, including flood control, water supply, irrigation, energy generation, containment of mine tailings, recreation and pollution control. The resources generated from dams are a valuable part of Kentucky's economy. The most common purpose for a dam is recreation.

Even though dams provide the population with many practical needs and recreational activities, most people take dams for granted. If a dam fails, the destruction can be catastrophic, leading to economic losses, environmental damage and even the loss of human lives. Due to the significant potential impact of dams, they require frequent inspections to identify issues in a timely manner.

The majority of dams are privately owned and operated, which is unlike other types of infrastructure. According to the Association of State Dam Safety Officials (ASDSO), approximately 58 percent of dams are privately owned, 16 percent are owned by local governments, four percent are owned by state governments, and the remaining 22 percent are owned by the federal government, public utilities and other groups. Dam owners are responsible for dam safety, which includes financing maintenance, upgrades and repairs.

The Federal Emergency Management Agency (FEMA) was granted administrative responsibility for the nation's dam inventory by the National Dam Safety Act of 1996. In Kentucky, the responsibility of funding safety inspections falls under the jurisdiction of the Division of Water (DOW). The DOW is part of the Kentucky Department for Environmental Protection. These offices are responsible for the permitting required for dam construction. The DOW is also

responsible for conducting or reviewing periodic inspections of existing dams, with the exception of dams regulated by other agencies, such as those related to coal mining.

Through inspection programs, dam safety in Kentucky has improved, although inspection programs by themselves do not guarantee that a dam will not fail. The inspection program needs to evolve into more detailed and frequent inspections as the dams increase in age. Typical causes of dam failure are internal erosion or seepage, slope stability failure and overtopping from a flood event. Another critical component involves communicating risks of dam failures to the public. A particularly useful and necessary tool is the development and active implementation of emergency action plans for dams. It is especially critical for high hazard dams, although it is suggested for all dams.

Currently, there are more than 1,000 regulated dams in Kentucky. These dams include all three hazard class categories. Dams are classified based on the potential threat to downstream life and property. A dam is classified as Class A (low hazard) if its failure is likely to cause no loss of human life, low economic losses and/or low environmental losses. Class B (significant hazard) structures are those that if failure or improper operation occurs, result is no probable loss of human life, but significant economic loss, significant environmental damage and/or probable disruption of lifeline facilities, including electrical power, gas and liquid fuel, telecommunications, transportation, water and sewer lines. The third category, Class C, is the highest hazard classification. In the event of failure or improper operation of a Class C dam, there is a high probability of loss of human life, high economic loss and negative environmental impact.

Each year the Division of Water (DOW) inspects approximately 300 dams, using a dedicated staff of approximately three inspectors, giving an inspector to dam ratio of 1:100. Each inspection consists of a file review of previously identified deficiencies, followed by a complete visual inspection. After the visual inspection, a letter and report are prepared for the owner that describes the observations and instructs the owner to fix any identified deficiencies. DOW inspectors will follow up when necessary to ensure that required remedial work is completed. Sometimes it is necessary to force an owner to properly maintain or modify a dam by taking enforcement action. These actions might include breaching of the dam and draining the lake or impoundment. In addition, DOW will take emergency action if a structure is in known danger of failing and poses a threat to life, or if it is likely to cause serious property damage. DOW is empowered to take emergency action if an owner abandons a dam or refuses to take necessary remedial actions.

Investment Needs

Despite growing hazards, deteriorating dam conditions and an increasing number of dams, funding for the dam program has declined over the past 30 years. A significant investment is needed to improve dams and the dam safety program in Kentucky. Funds are needed to hire and train an adequate staff of professional inspectors, rehabilitate critical dams, improve the communication and notification systems, and update inspection methods and equipment. The 1996 Dam Safety Act has been a helpful source for additional grant funds. These funds assist DOW in financing equipment purchases and other needs. Even with the additional grants, though, funding levels are not adequate to fulfill all capital needs in the state.

More than \$160 million in funds has been identified for repairs on state-owned dams, excluding the Kentucky River and Green River locks and dams, which are owned by the U.S. Army Corps of Engineers. Each dam on the Kentucky and Green rivers is at least 90 years old and has not been consistently upgraded. The average cost to repair each lock and dam on the Kentucky River is \$30 million. If these locks and dams are put under Kentucky's ownership in the future, the funds needed for repair would increase significantly. Of the dams that have been identified in need of repairs, 88 are considered deficient.

ASDSO recommends ten state regulators for every 250 dams, so that the oversight of the permitting and inspection components of state dam safety programs can be carried out in an effective manner. To comply with this recommendation, Kentucky would need to have approximately 40 individuals to regulate the dams. Currently, Kentucky employs six full-time professionals dedicated to dam activities. Kentucky employs three dam safety inspectors, which is below recommended levels. The cost to hire and train two additional inspectors would be approximately \$300,000 per year.

DOW does not offer a formal educational program to teach private dam owners about their responsibilities, proper inspection and maintenance techniques, or repair methods. An educational program would cost approximately \$100,000 per year. However, literature is currently available to dam owners, along with a website of comprehensive resource information. Until an official education program can be initialized and funded, DOW will develop and provide a formal seminar that will be made available to the public.

Private dam owners often have difficulty funding dam repairs, resulting in dams being breached and drained. Some form of assistance from the government would be helpful in maintaining the resources within the state, rather than destroying the dam. Government assistance could come in the form of low-interest loans, with an estimated cost of \$1 million.

Additional efforts will be needed in the near future to assist in analyzing and upgrading the state's dams, many of which were constructed more than 40 years ago. Dams typically have a design life of about 50 years.

RECOMMENDATIONS SUPPORTED BY ASCE

Overall, Kentucky has good dam safety programs, but due to recent funding reductions, the increasing age of the dams, and the recognition of additional safety measures, several recommendations have been made by ASCE:

- Increase staff to accommodate current and future inspection needs.
- Increase government appropriation and other funding sources for the repair and rehabilitation of dams.
- Develop a long-range capital program that accommodates the needs of state and municipally owned dams.
- Develop a long-term strategy to control downstream development through easements, purchases or partnerships.

- Create a more comprehensive inspection program that includes more than just visual inspections, but would include underwater, remote-controlled video cameras to inspect conduits through dams.
- Develop a formal education program to train private property owners in proper dam maintenance and how to recognize signs of structural problems in dams.
- Develop an emergency action plan (EAP) for all high hazard potential dams.

GRADE

DOW has done well overseeing the state's dam safety and floodplain compliance programs given the current level of resources. Of the more than 1,000 dams in Kentucky that are inspected on a regular basis, none of them are currently declared unsafe. However, significant needs have been identified such as the need to hire personnel, train dam owners, and find additional sources of funding, and therefore a D+ grade has been given.

ACKNOWLEDGEMENTS

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SOURCES

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