ISSUE BRIEF

KENTUCKY LEVEES

2011 Kentucky Grade: D+ Date: February 1, 2011

Kentucky has communities in flood-prone areas. Because of the 2005 Katrina disaster in New Orleans, Louisiana, Kentucky citizens need to be aware that the state's flood protection systems need to be upgraded and repaired.

CURRENT CONDITIONS

Kentucky's levees have not been previously evaluated by the ASCE Kentucky Section; they have been assigned a grade of D+. This grade reflects the current capacity of Kentucky's federal and non-federal flood protection systems to provide protection to communities at risk of flooding. The grade is a reflection of the collective safety of the entire system, including individual levees, floodwalls and pumping stations. Although there are federal standards, there is no system to specifically cover Kentucky. Flood protection systems that are under-maintained or that incorporate structures considered unsatisfactory were considered in the data utilized in this report.

The U.S. Army Corps of Engineers' (USACE) Levee Safety Program was created in the wake of Hurricane Katrina in New Orleans, Louisiana, in 2005. The mission of the Levee Safety Program is to assess the integrity and viability of levee systems and recommend actions to reduce the associated flood risks to the public, property and environment. Regulations developed by USACE are part of the effort to implement a more rigorous inspection program for levee systems, improve communication about the overall condition and associated risks of levee systems, and ensure more consistent national application of inspection standards. The Levee Safety Program resulted in several simultaneous initiatives designed to comprehensively address the safety of levee systems throughout the United States. The initiatives include the Periodic Inspection Program, the National Levee Database, the formalizing and updating of the Annual (or Routine) Inspection Program and levee safety evaluations associated with Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP).

The purpose of a periodic inspection is to verify proper operation and maintenance of levee systems, evaluate their operational adequacy and structural stability, and identify specific components and features to monitor over time. Periodic, detailed inspections are performed approximately every five years by teams of experienced engineers who assess the condition of a flood protection system and make recommendations for repairs and improvements or for addressing life safety issues. USACE performed periodic inspections in the 1970s, but the program was suspended after two rounds of inspections were completed. The first periodic inspections performed since the 1970s are now complete.

The National Levee Database was created as a result of direction from Congress to collect data on all existing levee systems. Such a database allows Congress to understand, perhaps for the first time, the magnitude of U.S. flood protection systems. For example, the number of miles of levee and floodwall in the national inventory is now known. This information can be paired with condition assessments and inspection results to rate flood protection systems to determine repair and investment priorities.

The Routine Inspection Program involves annual inspections of every federally funded flood protection system. The inspection program was revamped after Hurricane Katrina in 2005 to focus on areas of weakness in the inspection program that were recognized to be contributing factors to the failures of New Orleans' levees and floodwalls.

As part of the National Flood Insurance Program (NFIP), FEMA develops flood insurance rate maps (FIRMs) to identify areas that may be subject to flooding, for both determining flood insurance rates and floodplain management activities. Floodplain maps have been published by FEMA since the beginning of the NFIP in 1968.

Starting in 2003, FEMA embarked on a nationwide program called the Flood Map Modernization (Map Mod) Program. In Phase 1 of the Map Mod Program, FEMA provided digital flood hazard data and maps known as Digital Flood Insurance Rate Maps (DFIRMs), which are more reliable, easier to use and more readily available than the previous hardcopy FIRMs. As part of the remapping process, FEMA is verifying that all levees recognized on previous FIRMs have specific structural requirements certified by a registered professional engineer or a federal agency with responsibility for levee design, such as USACE. In addition, the levee must have been adequately designed and constructed to provide reasonable assurance of excluding a 100-year-flood from the levee protected area and thus meet NFIP levee system evaluation requirements.

The purpose of an NFIP levee system evaluation is to determine how flood hazard areas behind levees are mapped on FIRMs. A levee system consists of a levee or levees and associated structures, such as closure and drainage devices, which provide reasonable assurance of excluding flood water from an associated separable floodplain. The maps are used to determine flood insurance rates and federal, state and local floodplain management requirements, as well as inform other floodplain management decisions.

Cost Impact Items

Corrugated metal pipe (CMP) culverts and drainage structures located beneath vital transportation and flood management infrastructure have significantly deteriorated over the last several decades. The design life of a CMP is approximately 50 to 65 years, and most were installed beginning in the late 1930s and continuing into the early 1960s. Failure of these culverts can cause the structure above to collapse, potentially causing injuries and fatalities, along with reduced flood protection. Remediation of these deteriorating structures will cost millions of dollars nationwide, but the cost of inaction is economically crippling and a threat to public safety.

For more than a decade, USACE has observed continued significant deterioration in CMP drainage structures as they reach the end of their life expectancy. Failures, typically collapse, have also been observed in these structures in Kentucky. Conventional repairs of failed or failing CMPs have been costly because the typical repair method is an open-cut excavation with complete pipe replacement.

The state's flood protection projects contain approximately 776 gravity drainpipes, 593 of which are CMPs. Of those, only 78 CMPs have been rehabilitated to date. The remaining 515 CMPs will eventually need to be either removed and replaced using conventional methods, or they will need to be relined with new pipe.

Most of Kentucky's pump stations were constructed in the 1940s and 1950s.The electrical systems that control the pumps are aging and replacement parts are generally no longer available. Similarly, the pumps are aging and replacement parts may not be available. Although the pumps are infrequently under service loads, damage to pumps can happen in any flood event. All pump stations are generally in need of upgrades.

Investment Needs

Estimated costs were obtained to repair deficiencies in just 11 of the 29 flood protection systems in Kentucky. The reported total estimated cost is approximately $77 million. If it is assumed that the other 18 projects have similar levels of deficiencies, the total cost for Kentucky may approach $200 million. It may be unrealistic to assume that funding can be provided to correct all deficiencies and bring Kentucky's flood protection systems up to current USACE standards in the short term.

RECOMMENDATIONS SUPPORTED BY ASCE

The following recommendations are supported by ASCE:

- ASCE should consider partnering with USACE for this category
- One person from USACE, one person from one of the local sponsors who also represents the National Association of Flood Plain Managers and one person from ASCE should be included on the Committee for Flood Protection Systems
- More funding for maintenance, repair and upgrades to Flood Protection Systems in Kentucky is needed

GRADE

The condition of Kentucky's flood protection systems has continued to deteriorate as these systems age. Most of the projects were constructed between 1940 and 1960. Of Kentucky's 29 projects, only five had an acceptable rating, five had an unacceptable rating and the remaining 19 projects were all rated minimally acceptable. The Corps inspector provides the rating of individual items during annual inspection of flood protection projects. The District Levee Safety Officer provides the overall system rating after reviewing the ratings of all individual items within a system. A rating of "Acceptable" means the system is being maintained to a very high level and no major problems were found. A rating of "Minimally Acceptable" means there are

some items found that require maintenance or repair actions within a period of time established by the District. A rating of "Unacceptable" means the system is on notice that it has an item or items in poor enough condition to render the project potentially unsafe in the event of a flood. An Unacceptable rating automatically starts a process that will result in the system being removed from the Routine Inspection Program within a period of two years unless corrections are made. Federal funding, which paid for most construction costs, is no longer provided for operations and maintenance, and it must be funded by local sponsors. In the projects for which cost data was available, the total cost of five years of current operating and maintenance budgets is generally only a fraction of the estimated repair, upgrade and replacement costs.

As a result, an overall D+ grade is assigned to Kentucky's levees.

KENTUCKY LEVEES SUB-COMMITTEE

Terry M. Sullivan, PE, Committee Chair, U.S. Army Corps of Engineers

Christina Neutz, U.S. Army Corps of Engineers

SOURCES

1. Phone conversations with local sponsors for all Louisville District Federal flood protection projects.

2. U.S. Army Corps of Engineers, Huntington District; Periodic and Annual Inspections for all Federal projects.

3. U.S. Army Corps of Engineers, Louisville District; Periodic and Annual Inspections for all Federal projects.

4. U.S. Army Corps of Engineers, Nashville District; Periodic and Annual Inspections for all Federal projects.