

Investigators release preliminary findings of levee failures at Senate hearing

2 November 2005

Many of the New Orleans levee and floodwall failures in the wake of Hurricane Katrina occurred at weak-link junctions where different levee or wall sections joined together, according to a preliminary report released today (Wednesday, Nov. 2) by independent investigators from the University of California, Berkeley, and the American Society of Civil Engineers (ASCE).

Raymond Seed, UC Berkeley professor of civil and environmental engineering, and Peter Nicholson, an associate professor of geotechnical engineering at the University of Hawaii, presented several findings at a hearing this morning in Washington, D.C., before the Senate Committee on Homeland Security and Governmental Affairs. Seed is the head of a team investigating the levee failures with funding from the National Science Foundation and the UC Berkeley-based Center for Information Technology Research in the Interest of Society (CITRIS), and Nicholson is head of the ASCE geotechnical team.

The UC Berkeley and ASCE teams have been collaborating for weeks with the U.S. Army Corps of Engineers to investigate the flooding, but the findings unveiled today were developed independently of the Corps. The report presents an overview of initial observations and findings regarding the performance of the New Orleans flood protection system.

The researchers found significant erosion and inconsistencies in crest heights at "transition" points where the earthen embankment meets up with concrete structural sections in the levee system. The disparities in levee sections exist, the report points out, because multiple authorities are responsible for designing and maintaining different sections of the levee system.

In addition, areas where the perimeter flood protection system was disrupted to allow passage of trains or other surface transit created other

points of vulnerability.

"Levees are 'series' systems, where the failure of one component means failure of the whole system," said Seed in his congressional testimony. "They have less redundancy than many other engineered systems, and the consequences of failure are high."

Other preliminary findings reported today include:

- * While storm surges resulted in water rising over the tops of and overwhelming numerous levees and floodwalls, three major levees along the banks of the 17th Street and London Avenue canals failed at water levels below the tops of the floodwalls. The failures at these levees were not caused by overtopping, but instead were likely caused by weaknesses in the soil underlying the foundation of the levees.

- * Piping erosion, characterized by water tunneling through the soil, possibly due to or worsened by the uprooting of trees on or near the levee, may have contributed to the London Avenue Canal failure.

- * Many of the levees and floodwalls that failed due to overtopping could have performed better had relatively inexpensive modifications been implemented.

The investigators said the addition of erosion protection -- including concrete splash slabs, paving of the ground surface in key locations, or piles of rocks placed on top of the soil -- on the back or land sides of floodwalls might have helped protect the levees that were overtopped.

"The performance of many of the levees and floodwalls could have been significantly improved, and some of the failures likely prevented" had such erosion prevention measures been taken, Seed testified before the committee, which is chaired by Sen. Susan Collins (R-Maine) and Sen. Joe Lieberman (D-Conn).

The failures and damage observed at the flood protection system's transition points call for an overall review of the design of the entire system, said Seed. As the Army Corps of Engineers works to repair and rebuild the New Orleans levees, the investigators suggest that an independent board of consultants be retained to review the adequacy of the interim and permanent levee repairs now underway. The report notes that such boards are commonly used by public agencies to review the design and construction of major dams.

"The U.S. Army Corps of Engineers is stretched very thin right now, trying to respond and effect emergency and interim repairs in the wake of this catastrophe," said Seed at the hearing. "It must be the job of the federal government, and oversight committees such as this one, to ensure that (the Corps) has the resources and technical capabilities to get its job done safely and well. ... As much of the population is currently being permitted to re-occupy portions of the New Orleans area, doing everything possible to ensure the safety of these people and their neighborhoods must continue to be the highest priority."

Other UC Berkeley researchers involved in this levee investigation are Robert Bea, professor of civil engineering; Jonathan Bray, professor of civil engineering; Juan Pestana, associate professor of civil engineering; and Rune Storesund, a graduate student in civil engineering. They are members of the Katrina Recovery Task Force, which was formed under the auspices of CITRIS.

Source: UC Berkeley

APA citation: Investigators release preliminary findings of levee failures at Senate hearing (2005, November 2) retrieved 28 October 2020 from <https://phys.org/news/2005-11-preliminary-levee-failures-senate.html>

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