US Army Corps of Engineers

News Release

For Immediate Release – Point of Contact:
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IPET Releases Results on London Avenue Canal Breaches

NEW ORLEANS, May 2, 2006 - The Interagency Performance Evaluation Task Force (IPET) today is releasing the preliminary results of its analysis of the failure mechanisms of the two breaches that occurred on the London Avenue Canal in New Orleans, La., during Hurricane Katrina on Aug. 29, 2005.

The IPET results concerning the two breaches are available from the IPET public Web site, https://ipet.wes.army.mil, entitled *Volume V – The Performance: Analysis of the London Avenue Canal I-wall Breaches*. This 40-plus-page document will be included in Volume V of IPET's draft final report, scheduled for release on June 1.

The London Avenue Canal south breach occurred on the east side of the canal near Mirabeau Avenue. The north breach occurred on the west side of the canal near Robert E. Lee Boulevard. At both locations, the levees and I-walls were on top of a layer of marsh (peat) that was in turn on top of a sand layer (the north breach area also had a thin clay layer between the marsh and sand on the land side). The south breach was approximately 60 feet wide; the north breach was about 410 feet wide.

The comprehensive IPET investigation included field observations and tests, a variety of laboratory soils tests, and physical modeling tests in research centrifuges. These analyses showed common factors for the two failures, high water pressures within the sand layer under the levee and high water loads on the floodwalls. The London Avenue Canal breaches had a key factor in common with the 17th Street Canal breach; the formation of a gap between the sheetpile wall and the levee material on the canal side. On both canals, the formation of the gap allowed high water pressures to move down the canal face of the sheetpile wall. However, at London Avenue the gap allowed water to flow down the sheetpile into the underlying porous sand. The high water pressures in the sand uplifted the marsh layer on the land side, causing erosion that removed material and reduced support for the floodwall.

IPET is still conducting comprehensive tests on the floodwalls themselves and reviewing construction documents. Apparently, the design forces on the wall were not exceeded, nor were the floodwalls overtopped. The soils at the floodwall area were weak and could not handle the forces that the water put on them. IPET has not seen this failure mechanism in other projects, but is still searching literature for information on similar failures.

IPET is also testing the Orleans Canal floodwalls and levees that did not fail. We will compare the 17th Street and London Avenue findings to the Orleans tests to see what lessons we can learn from these similar canals and why they behaved as they did.

From the construction document reviews to date, the presence of the sand layers was well known at London Avenue Canal, but considered safe as long as water did not have access to this material. The sand layer was not connected to the water in the canal due to a layer of silt on the canal side. In fact, design documents state that no dredging was to be allowed in the canal so as not to disturb this silt layer. The gap at the sheetpile that formed was the mechanism that allowed water under pressure into the sand layer. If water had not gotten into the sand layer, at this time IPET believes the London Avenue levee would have held.

Again, construction and maintenance documents are still being reviewed. At this time, IPET does not believe trees or any man-made structures contributed significantly to the levee failure. Final results will be presented in IPET's June 1 report.

South Breach (east bank) Mechanism

At the south breach (east bank of canal), analyses showed that the subsequent erosion and piping of material on the land side of the levee probably played an essential role in the failure. Eventually enough material was eroded so that the floodwall lost support and collapsed. The IPET finding that the south breach failure started in a small zone of intense erosion and piping is consistent with the narrow (60 feet wide) breach that eventually developed.

IPET is looking at the cold-rolled sheetpiles that were used at the south breach instead of hot-rolled sheetpiles. Cold-rolled sheetpiles have lower interlock strengths (interlocks are where the sheetpile sections join). Water seepage might have increased if the interlocks failed when the sheetpiles were originally driven. IPET findings on this will be presented in the draft final report on June 1.

North Breach (west bank) Mechanism
At the north breach (west bank of canal), analyses and field observations indicate that sliding instability was the primary mode of failure. A playhouse on the property adjacent to the breach was heaved upward, indicating upward movement of the ground inboard of the levee toe. High uplift water pressures likely resulted in erosion through the marsh layer and the thin layer of clay, similar to the south breach. However, at the north breach area, the sand was loose with a lower strength or friction angle than at the south breach. The high uplift pressures within this less-dense sand were sufficient to cause instability without significant subsurface levee erosion. Basically, the whole section (410 feet) became unstable and moved landward and upward, causing the large failure.

IPET Findings
These results, coupled with the I-wall problems at the 17th Street Canal have led the U.S. Army Corps of Engineers to examine extensively all I-walls in the New Orleans protection system. The breaching mechanisms discovered for these sites, along with investigations of geologically similar areas on the Orleans Canal that did not breach, are the basis for the criteria being used to examine sections of the hurricane protection system that appeared to be undamaged by Hurricane Katrina for potential future problems.

IPET will issue its final draft report on June 1. All IPET reports to date (Jan. 10 and March 10) are also available from the IPET public Web site at https://ipet.wes.army.mil, which also has hundreds of other documents related to the hurricane protection system design and construction, IPET data collection and IPET analyses

All IPET findings and reports are being reviewed and validated by an independent panel from the American Society of Civil Engineers (ASCE). The IPET and ASCE findings are in turn being reviewed and synthesized by an independent panel from the National Research Council (NRC), which should produce its final report in September 2006. IPET will address the final comments by the ASCE and NRC panels and finalize the IPET report in the fall.

The Corps' Task Force Guardian that is repairing New Orleans levees to "pre-Katrina" levels by June 1 has been receiving IPET recommendations from the start of IPET's investigation to ensure the ongoing repairs make optimum use of other IPET "lessons learned" so the system will be stronger than before. IPET findings will also be incorporated into future design guidance so that problems discovered by IPET will be corrected in future protection designs and projects.

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