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News Release

For Immediate Release – Point of Contact:
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IPET Releases Results on Inner Harbor Navigation Canal Breaches

New Orleans (May 15, 2006) - The Interagency Performance Evaluation Task Force (IPET) today is releasing the preliminary results of its analysis of the four Inner Harbor Navigation Canal (IHNC) breaches, specifically the failure mechanism for the north breach on the east side, that occurred in New Orleans, La., during Hurricane Katrina on Aug. 29, 2005.

The IPET report concerning the IHNC breaches is available from the IPET public Web site, https://ipet.wes.army.mil, entitled *Analysis of Performance of the Inner Harbor Navigation Canal (IHNC)*. This document will be included in IPET's draft final report, scheduled for release on June 1.

The IHNC had four breaches during Hurricane Katrina; two on the east bank between the Florida Avenue bridge and the North Claiborne Avenue bridge adjacent to the Lower 9th Ward and two on the west bank north of the intersection of France Road and Florida Avenue. At all four breach locations, the levees and I-walls were on marsh material layers overlying a clay layer.

Initial field observations indicated that the three floodwall breaches (one on west bank; two on the east bank by Lower 9th Ward) on the IHNC failed due to overtopping and subsequent scour and erosion, causing failure due to loss of the levee supporting the floodwall. Evidence of this scour could easily be seen on the unbreached sections of the east side I-walls where U-shaped scour trenches were next to the floodwalls. One levee section without floodwalls on the west side was overtopped and eroded until it breached.

However, a recent timeline of flooding in different areas compiled by the IPET team that conducted field data collection (eye witness accounts, stopped clocks, etc.) showed that the water level in the Lower 9th Ward near Florida Avenue was rising as early as 5:00 a.m. on Aug. 29 before any overtopping would have occurred. At that time, IPET is estimating that the water level in the canal was approximately 10 feet; the floodwalls on the east bank were approximately 12.5 feet high. IPET information on the flooding rate for the Lower 9th Ward shows a significant increase in the rate of the rising water level after 7:00 a.m., indicating the larger southern breach on the east side had occurred.

This information led IPET to more closely examine the breaches on the east side of the IHNC adjacent to the Lower 9th Ward. The larger south breach was approximately 600 feet wide; the north breach near Florida Avenue was about 200 feet wide. The I-walls on the east side were driven in a clay levee fill that was over a marsh material layer that overlaid a clay layer. These foundation conditions are similar to those encountered at the 17th Street Canal.

Because of these similarities, IPET examined both breach locations on the IHNC east side for evidence of formation of a gap between the sheetpile wall and the levee material on the canal side. This gap or crack formation was instrumental in both the 17th Street and London Avenue Canal failure mechanisms. On both of these canals, the formation of the gap allowed high water pressures to move down the canal side face of the sheetpile wall. IPET found no significant wall movement at the larger south breach. However, significant wall movement was indicated at the north breach near Florida Avenue, indicating that the gap might have formed at this breach location.

Continuing its comprehensive investigation, IPET focused on soils analyses, which included information from soil borings taken prior to Katrina, lab tests on soil borings taken after Katrina and cone penetration tests to measure soil strength that were conducted after Katrina. IPET also conducted slope stability analyses on both east side breach soil conditions. Tests were conducted with both the gap formation assumed and without a gap.

The IPET soils tests showed that the marsh material layer was approximately 17 feet thick on the east side. The upper eight to nine feet of this marsh layer was significantly stronger than the rest of the marsh layer. Testing also showed that the marsh layer was stronger beneath the levee crest where it was compressed from the levee's weight, but weaker at the toe of the levee and beyond where the marsh layer was not compressed. Analyses by IPET showed the soil strengths were greater at the toe of the larger south breach and than at the north breach at Florida Avenue.

To determine factors that might have caused this, IPET examined survey data of the levee on the east side. IPET determined from the survey data that there was a natural decrease in elevation on the landside toe of the levee that ran from the south breach to the north breach of approximately four feet. The north breach levee toe had less soil pressure to consolidate and strengthen the underlying soil layers there. Analyses showed that the soil strengths at the toe of the levee at the north breach (Florida Avenue) were lower than those at the south breach.

From its analysis, IPET believes the design forces on the I-wall at the north breach on the east side of the IHNC were not exceeded, nor was the floodwall overtopped. The weaker marsh material at this location, coupled with the gap forming on the canal side of the sheetpile and the lower soil strength at the toe of the levee on the neighborhood side of the levee made the floodwall weak; it

could not handle the forces that the water put on it at this location. The 200 foot section near Florida Avenue became unstable and failed in the lower, weaker section of the marsh layer.

IPET believes if the gap or crack had not formed at the sheetpile face, that this floodwall section would have remained intact, but would have still possibly overtopped later on the morning of Aug. 29 as the water levels in the IHNC rose.

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, London Avenue and IHNC findings to the Orleans tests to see what lessons we can learn from these similar canals and why they behaved as they did.

IPET Findings

These results, coupled with the I-wall problems at the 17th Street and London Avenue Canals, have led the 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 thousands 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, which is repairing New Orleans levees to "pre-Katrina" levels, 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.

At the IHNC east side breach sections, Task Force Guardian is replacing/repairing those walls back to pre-storm project authorized elevations of 15 feet. To enhance the stability and resiliency of the protection system, the

breached I-wall sections are being replaced by T-walls and other I-wall sections will be reinforced. According to Task Force Guardian, the IHNC repairs are on schedule for June 1 completion.

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