US Army Corps of Engineers
Mississippi Valley Division
Corps Hurricane Response

Task Force Hope Status Report *July 8, 2008*

Anatomy of a levee

Corps of Engineers building them stronger, more resilient

Clay must pass stringent testing and meet specific standards to be used for levees

By Susan Spaht

Earthen levees have been the main source of flood protection for south Louisiana since the founding of New Orleans in 1718. Today, earthen levees are responsible for holding back the waters of the Mississippi River, and reducing the risk of hurricane surges.

The Corps of Engineers is responsible for 973 miles of Mississippi River levees and floodwalls along with the 325 miles of levees and floodwalls (as well as gated outlets, pumping stations and closure gates) that make up the Hurricane and Storm Damage Risk Reduction System (HSDRRS). That is almost 1,300 miles of structures protecting this area from flooding; and the bulk of those are earthen levees.

The levees in the HSDRRS are being restored and/or raised by the Corps of Engineers to provide 100-year level of protection with completion expected in 2011. This enormous task involves much more than simply pushing dirt up a hill. It takes an integrated team of experts working toward a mutual goal. The Corps' levee-building team includes design engineers, cost engineers, hydrologists, geotechnical engineers, real estate experts, surveyors, borrow specialists, environmental experts and construction contractors.

Bulldozers push soil material up an earthen levee to build a new levee lift. The material used for levees is clay soil that requires numerous tests before it is accepted for levee embankments. (USACE Photos)

Before Construction Begins

The Corps of Engineers is building earthen levees to rigorous engineering standards. It accepts only a particular type of soil material (clay) for use in building the levees. Clay soil

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will be rejected if it does not meet the specific requirements for density, moisture content, plasticity index (PI), and organic material content.

The Corps determines the height and width of levees based on hydraulic and geotechnical engineering criteria. Additional post-Katrina requirements call for building the earthen levees in smaller increments – 1,000 to 5,000-foot sections - which offers improved quality assurance.

Additionally, the Corps team is testing and re-testing its work and materials at every step of the way.

A dump truck empties its load of approved clay at a levee-building site.

Construction of the Levee

Using all the engineering information, the levee construction team will first perform an **alignment layout,** a survey of the original levee to designate the footprint of the new, widened and heightened levee, and to estimate needed quantities of clay material. Project engineers provide the location of the baseline, i.e, the horizontal control points, to the construction contractor who will use the baseline to layout the new levee centerline. Surveyors will then take the cross sections of the existing levee, or the ground in the case of a totally new levee. The Corps will then apply the "design levee template" to the cross sections for the estimating the needed quantity of clay soil.

The next step is the **clearing and grubbing** phase which involves stripping any existing grass, shrubs or trees from the footprint of the new (usually wider) levee.

After all vegetation has been cleared**, scarifying** of the levee takes place. This is the process of roughing up the surface of the levee to prepare it for embankment building. When bulldozers push the new clay on top of the old levee, the scarified surface allows blending and bonding of the old foundation with the new embankment.

Bulldozers scarify a levee surface to prepare it for a new lift of clay. This process roughens the levee and allows the existing surface to bond and blend with the new lift. (USACE Photos)

The new embankments of the levee are placed in lifts of 6" to 12", roughly parallel with the new centerline. After compaction and before the next lift is put in place, **soil testing** is done to prove the clay meets the engineering standards. The embankment building, compacting process and soil testing is repeated for each lift until the designated height is reached. A typical levee requires two to four lifts to reach the designated height, although some require many more.

When the lifts are completed, a **compliance survey** is performed to ensure that the construction contractor

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has built the levee in accordance with the specified lines and grades, and within the specified tolerances.

The last step is **fine dressing** wherein the levee is smoothed to prepare it for fertilizing, mulching and **turfing** (planting grass). Depending on the time of year the levee is completed, the contractor will plant either winter grass, summer grass or a combination of both. The root system of the grass performs as basic **armoring** for the levee. This is important for protecting the surface of the levee from rain erosion.

The Corps is working with independent botanists and university technical teams to develop grasses that germinate quickly, grow quickly and remain solid and thick throughout the year. At the present time, Bermuda grass is the preferred vegetative armor for levees.

All earthen levees being built and/or raised to meet the 100-year level of protection for the HSDRRS are required to go through these steps for approval by the Corps of Engineers.

Even with all its improved methods and utilization of lessons learned since Katrina, the Corps is continually looking for better materials and studying improved procedures to build levees that will best provide a lower level of risk from flooding for the citizens of Louisiana.

This levee has been "fine dressed" and awaits the turfing process.

The Corps is testing different types of grasses to obtain the hybrid most suitable for levees.

This levee is receiving hydro-mulching - spraying of grass seed, fertilizer and mulch all in one process. (USACE Photos)

U.S. Army Corps of Engineers

Levee Definitions & Distinctions

Levee: an earth embankment, floodwall or structure along a water course whose purpose is flood damage reduction or water conveyance.

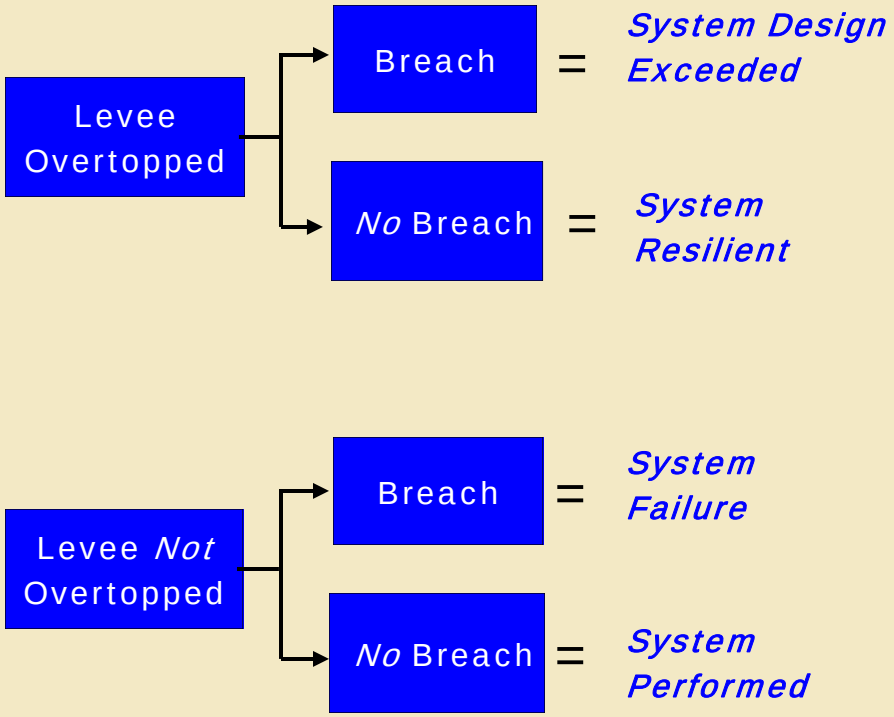
Overtopping: water levels that exceed the crest elevation of a levee and flow into protected areas.

Breach: a rupture, break or gap in a levee system whose cause has not been determined.

Overtopping Breach: a breach whose cause is known to be a result of overtopping (system exceeded).

Failure Breach: a breach in a levee system for which a cause failure is both known and occurred without overtopping. Usually requires an investigation to determine cause.

Levee Flooding Descriptions



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The *Status Report Newsletter* supports the information program for Task Force Hope and its stakeholders. It also serves as the primary tool for accurately transmitting the Corps' hurricane recovery work to stakeholders.

This is an online publication and open to public distribution.

This issue and past issues can be found at:
http://www.mvn.usace.army.mil/hps

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The Status Report Newsletter is an unofficial publication authorized under the provisions of AR 360-1. Views and opinions expressed are not necessarily those of the Corps of Engineers or the Department of the Army.

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100-Year Design Elevation Map now available on Corps web site

This is a detail of the recently-released 100-Year Design Elevation Map created by the Corps of Engineers. This map gives Pre-Katrina elevations (blue), Current elevations (brown), and the projected 100-Year Level Protection elevations (green) that are the goal for the entire Hurricane and Storm Damage Risk Reduction System. To view the entire map, go to this site:
http://www.mvn.usace.army.mil/hps/100yr_design_map.html

Congress passes 6th Emergency Supplemental

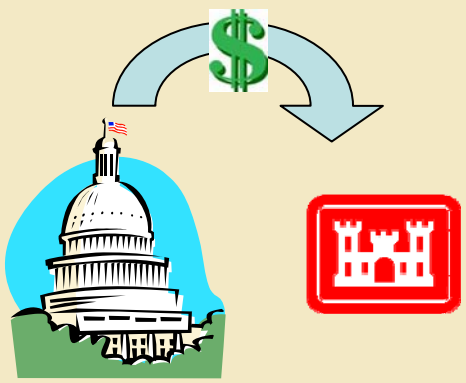
"This is historic and significant."

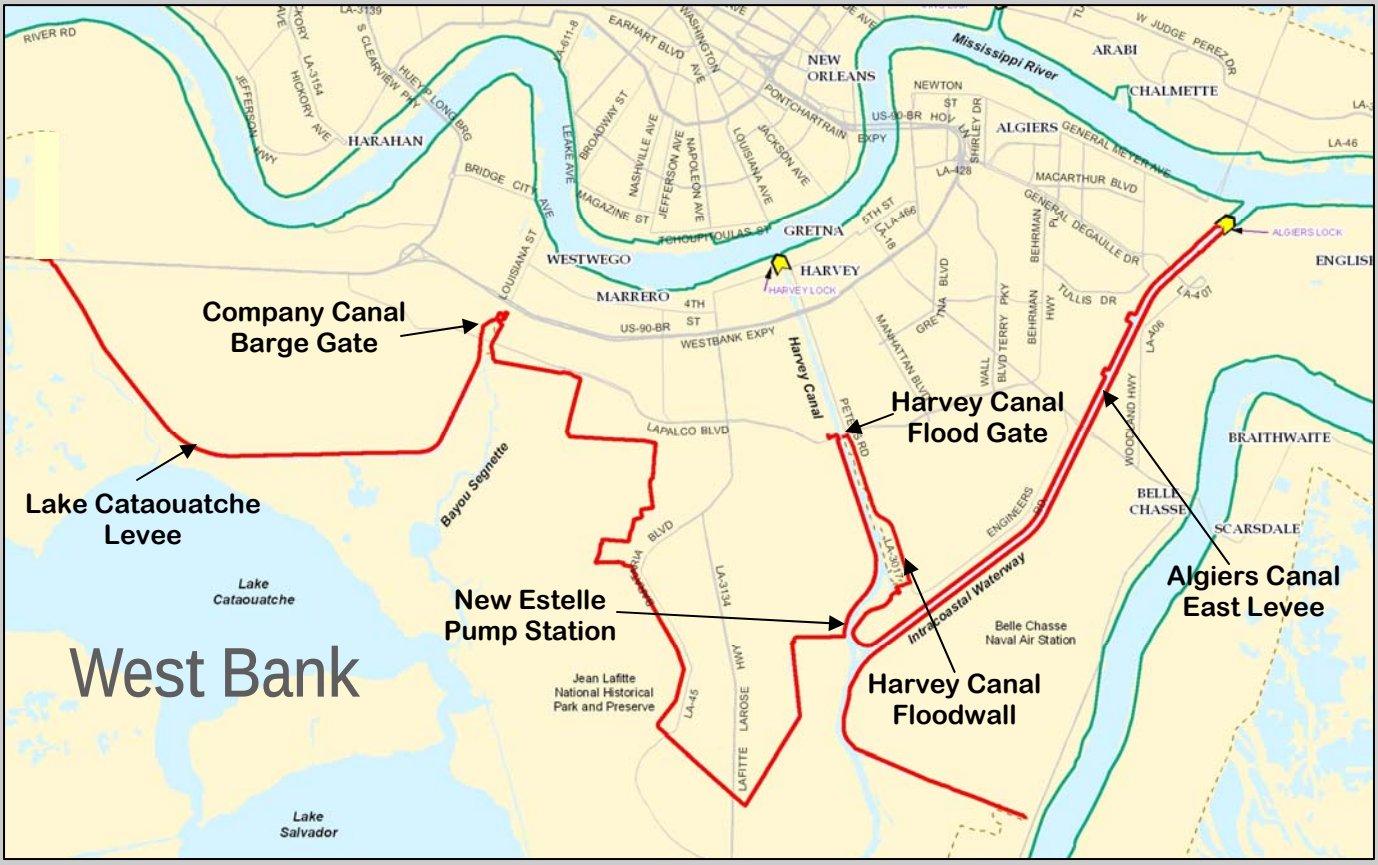
- Karen Durham-Aguilera, Director, Task Force Hope

On June 30, 2008 Congress signed into law the 6th Emergency Supplemental bill. This bill provides $5.7 billion in funding for the greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). When added to the already-appropriated $7.1 billion, the total federal commitment adds up to $12.8 billion.

In other words, the federal portion of the HSDRRS is now fully funded.

"The continued commitment by the Administration and Congress to provide for the recovery of greater New Orleans is historic and significant," said Karen Durham-Aguilera, Director of Task Force Hope. "The Army Corps of Engineers, together with our partners and stakeholders, will continue our dedicated efforts to provide 100-year level of protection in the year 2011."





Projects underway in every section of the

West Bank & Vicinity

By Lee Mueller

As the peak of the 2008 Hurricane Season nears, residents of the West Bank have the best risk reduction system they've ever had. If a major storm approaches the West Bank and Vicinity today, residents and businesses would be better protected than before Hurricane Katrina. Hurricane and Storm Damage Risk Reduction System (HSDRRS) projects are underway in every section, and interim improvements have been made throughout the West Bank and Vicinity project to reduce risk for the area.

Currently, 24 miles of levees are being raised to previously authorized elevations and two and a half miles of new floodwalls are being constructed throughout the West Bank and Vicinity project. Another six miles of existing floodwalls have been strengthened and armored to improve resiliency. More than $300 million in construction contracts has been awarded for the area, and another $200 million has been spent on design, inspection and environmental compliance.

The Harvey-Westwego and the Gretna-Algiers areas benefit from the HSDRRS projects at the Harvey Canal. The Harvey Canal Floodgate, which was operational in August 2007, is a major surge protection feature located in the Harvey Canal at Lapalco Boulevard. This floodgate provides a closure across the canal to elevation +11 feet, and provides hurricane surge protection to residents and businesses north of the gate. This structure also utilizes pumping capabilities to maintain safe water elevations in the canal above the gate.

Until the floodwalls along Peters Road and the earthen levees along the west bank of the Harvey canal are constructed, the areas neighboring the canal will be protected with HESCO baskets, placed by the local sponsor, in the event of a storm.

The Lake Cataouatche and Harvey-Westwego areas will benefit from a barge gate which was installed at

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Harvey Canal Sector Gate Complex Station

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Company Canal. If a storm surge threatens the vulnerable floodwalls of the canal, the barge gate can be closed, thereby taking these floodwalls out of the first line of defense against storm surge.

Levee construction has been ongoing throughout the West Bank and Vicinity since Hurricane Katrina, progressively providing residents with higher, more robust levees.

Many Projects Planned

The West Bank and Vicinity project was largely unconstructed when Hurricane Katrina hit the area in 2005. The authorized project was about 40% complete. When it is completed, the West Bank and Vicinity Project will consist of approximately 70 miles of levees, floodwalls, floodgates and other flood control structures to protect residents and businesses. The features of these structures will provide the level of protection necessary to achieve certification required for participation in the National Flood Insurance Program, and will avert catastrophic loss of life and property during major storm events.

There are currently three on-going construction contracts which will raise eight miles of levees in the Lake Cataouatche area. These levees will be raised again to achieve 100-year protection certification by 2011. Interim measures to strengthen transitions between the levee and the Lake Cataouatche Pump Station, and temporary I-walls to protect from storm surge are 95% complete. Fronting protection in the form of a floodwall protecting the station from storm surge and backflow prevention for the pumps will be completed by 2011.

Levees throughout the Westwego to Harvey area are currently being raised to provide the authorized levels of protection, with additional lifts required for 100-year protection. The Company Canal and Bayou Segnette floodwalls must be replaced to meet new design criteria. Such floodwall replacement work began at Company Canal in 2008; completion is scheduled in 2010.

To complete flood protection to the south of the Harvey Canal Floodgate, about three and a half miles of floodwalls and one mile of levee will be constructed along the east bank of the Harvey Canal, and two and a half miles of levee will be constructed on the west bank. Currently, more than two of the three and a half miles of floodwalls along Peters Road are under construction with a completion date scheduled for November 2009. A construction contract to raise the earthen levees on the west bank of the Harvey Canal was awarded May 2008 with an expected completion date of October 2008. This contract will raise levees to elevation +9.5 feet.

The majority of the levees along the Algiers Canal have been raised to +9 feet; however, some settlement has occurred. The last reach of the Algiers Canal levees, the industrial area along the lower east bank of the canal, is currently being raised to +10 feet. Algiers Canal levees are being raised to the previously author-

New Estelle Pump Station and levee

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ized level of protection, and additional levee lifts and improvements will be required to achieve the 100-year level of protection.

As an alternative to parallel protection along both the Algiers and Harvey Canals, a navigable floodgate and pump station located in the Algiers Canal or the Gulf Intracoastal Waterway is being evaluated. These structures would remove the parallel protection (levees) and floodwalls of the Harvey and Algiers Canals as the first lines of defense from storm surge, and would eliminate the need to raise all levees and structures to 100-year elevations. The preferred alternative for the 100-year protection of the Harvey and Algiers Canals will be determined by September 2008, with construction anticipated to begin in early 2009 .

Areas Still Vulnerable

As the Corps works towards its 2011 goal, there remain several areas of vulnerability in the West Bank and Vicinity project. The western and eastern tie-ins of the system both require construction to link the HSDRRS levees to the Mississippi River levees which would close the barrier system. The western-most portion of the project is currently undergoing an engineering analysis to determine the best alignment. The Corps plans to begin construction in early 2009. Completion of the western tie-in is expected by June 2011.

The alignment of levees and floodwalls to form the eastern tie-in at Oakville is also being finalized. The eastern tie-in feature will go to construction in early 2009.

Trucks deliver clay for the levee at Lake Cataouatche

West Bank & Vicinity

Company Canal floodgates under construction